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MONTANA OUTDOORS

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KEITH SZAFRANSKI

Up, Up, and Away— Montana's Soaring Eagles

by Dennis Flath and Rob Hazlewood

Anticipating a strike, we watched our dry flies riding buoyantly on the water near the rising trout. Abruptly, our attention was captured by the reflected image of an adult bald eagle as it passed overhead. As we looked up to watch the eagle glide from view, a respectful silence settled over the river. A silent time to recall that just five years ago, few bald eagles nested in Montana, and the chance of seeing one during a summer fishing trip was slim. Today, Montana hosts an expanding breeding population of bald eagles. Summer sightings are still rare, but in time, many more Montanans may be able to spot our national symbol during a summer outing.

The American bald eagle, *Haliaeetus leucocephalus,* isn't really "bald." The term "bald" comes from an early colonial expression meaning "white" or "white-headed." Only adults at least 4 or 5 years old have the characteristic white head and tail. Immature eagles are brown, or brown mottled with white. The bald eagle is not closely related to the more abundant and much more widespread golden eagle, a familiar sight in Montana. Instead, it is a member of the sea eagle genus, composed of a number of separate species found throughout Europe, Asia, and Africa. The bald eagle occurs only in North America.

Because most bald eagles breed in Canada and Alaska, Montanans are most likely to see bald eagles during spring and fall migration and in the winter. In fact, over the last few years, approximately 50,000 visitors have annually traveled to Glacier National Park to view the autumn concentration of bald eagles (see "McDonald Creek's Bald Eagles: An International Resource," *Montana Outdoors,* Nov./Dec. 1982). In late November, this spectacular assemblage of eagles begins to disband. Most make their way south or west, while others winter at various locations throughout the state. An average of 480 bald eagles winters within Montana each year. Because of the fame of the Glacier bald eagle concentration and the large number of wintering birds in our state, many Montanans assume they occur only as migrants. Few people realize Montana also hosts a significant bald eagle breeding population and the opportunity to view the birds during spring and summer.

Lewis and Clark first recorded bald eagles in Montana in 1805. Although they mentioned bald eagles in their journals, they did not specifically mention nesting activity.

Other early naturalists such as James Graham Cooper, E.S. Cameron, P.M. Silloway, and A.A. Saunders likewise described bald eagles in Montana, and some even referred to known nesting sites. A review of their published accounts suggests the bald eagle was relatively uncommon as a breeding species, except in the northwestern part of the state. While migrating, however, it was apparently common then, as it is now.

With the influx of the white man in the 1800s, some wildlife began to decline. The bald eagle was no exception. This decline was probably caused by two factors often operating together—direct mortality and habitat alteration. Eagles were shot for recreation and also because some people assumed a predatory bird was a "bad" bird. Bald eagles also died when they fed on strychnine-laced bait put out for wolves. A few eagles probably died when they were caught in steel traps intended for coyotes or wolves.

Habitat alterations included removal of trees along major waterways for fuel to power steamboats. This was probably a major habitat impact in some areas, but homesteading and the demand for railroad ties also contributed to removal of timber from floodplains.

Poison, human disturbance, habitat destruction, and shooting continued to affect bald eagles and their habitat during the 20th century. After World War II, a new threat, DDT, appeared.

This pesticide, which causes eggshell thinning, was apparently responsible for poor reproduction and a drastic decrease in eagle numbers. The impact of DDT on Montana eagles is unknown, but at least seven nests in eastern Montana and one in western Montana were abandoned between 1953 and 1976. Well-known and better documented declines elsewhere led to the bald eagle's federal classification as an endangered species on Feb. 14, 1978.

Human-caused mortality of bald eagles continues to occur in Montana, but at a much reduced level. A study in Montana and Wyoming listed seven factors responsible for continued bald eagle mortalities. Strychnine poisoning, lead poisoning, electrocution, and unknown trauma account for the largest percentage of known mortalities. Other causes include disease, glycol poisoning, collisions with vehicles, and unknown factors. Some eagles which died of various causes were found to carry sub-lethal levels of lead in their blood; this recent study revealed no mortalities from either shooting or steel traps, although these factors continue to be viewed as potential sources of mortality.

In the 1970s, researchers estimated that -12 to 17 pairs of bald eagles nested in Montana. Complete surveys were not conducted, so the real number could have been higher. In 1980, biologists conducted nesting surveys specifically to document the number, distribution, status, and productivity of bald eagle breeding territories. Since then, the various resource management agencies have coordinated their surveys each year. The result has been a growing inventory of known bald eagle breeding territories in the state.

The 1980 surveys found 23 nest sites, some previously known or rumored, but others discovered during aerial surveys. Each year, more nests have been discovered, with 66 occupied at least once since 1970. In 1985, 51 were occupied. Nobody knows how long some of these nesting sites have been around. However, researchers can pin down the year in which 18 current nesting territories were initiated. This provides valuable information about preferred nesting habitat and

KEITH SZAFRANSKI

Bald eagles often use the same nest year after year, repairing it and adding new materials each time. Average brood size is just under two young per successful nest.

KURT ALT

behavior of an expanding eagle population. Distribution of current nest territories appears similar to historic distribution, except that today no nests are found in northeastern Montana.

Bald eagle nests are usually found in timber stands three acres or larger, with canopy closures (a measure of how much shading the trees give to the ground) of less than 80%. Live trees most often chosen as nest sites are ponderosa pine, Douglas-fir, and cottonwood. Eagles also use snags of these species when suitable live trees are unavailable. They nest in the largest mature trees in the stand. An open flight path to the nest is essential to accommodate the eight-foot wing span of the eagle, and sturdy horizontal limbs are necessary to support the bulky nest which may weigh up to two tons.

They most often nest on flat to moderately sloping terrain with a northern aspect, and within sight of a lake or reservoir larger than 80 acres, or a major river or large stream. Eagles always nest within one mile of a body of water with adequate food, and most nests are built within one-half mile.

The sequence of nesting events in Montana is well-documented. Bald eagles arrive on their nesting territories in January or February and begin courtship and nest repair. Courtship reinforces pair bonding before copulation and successful egg-laying. Nest repairs may also reinforce pair bonding. Eagles usually maintain and construct nests during late winter,

but they also do this at other times of the year, particularly if a nest has been destroyed. The female lays her eggs between late February and late April, with peak laying during early March.

Incubation of the eggs takes 34 or 35 days. The nestling stage, from hatching to fledging (first flight), takes about 12 weeks. Fledging takes place from late June to mid-August with the peak in mid-July. Consequently, bald eagles are tied to their nest sites for a substantial part of the year, spending about six months with reproductive activities.

While in the nest, young eagles grow rapidly, and require a constant food supply. Adults must be able to capture a large amount of prey to provide for their growing young and themselves. This is why an abundant food supply must be available fairly close to the nest.

Eagles usually forage within 1.5 miles of the nest, but researchers have seen them foraging as far as five miles from the nest site. The availability and quality of food, water fluctuation, and disturbance all influence how far from the nest eagles forage.

What bald eagles feed on while they are nesting in Montana is not very well documented. Preliminary research suggests that waterfowl, salmonids, suckers, whitefish, carrion, and small mammals are important. In some cases, nesting bald eagles rely heavily on coots or ground squirrels. Because adequate food sources are a critical part of the nest territories, it logically follows that habitat for prey species is also important to bald eagles. These important habitats include wetlands, major water bodies, spring spawning streams, big game winter range, and areas that green up early in the spring, to name a few.

Once the young can fly, they gradually begin foraging on their own. It's not a quick and easy change for them, but an extended period of learning which requires continued attention by the adults. Young bald eagles (fledglings) continue to beg food from adults as long as they can. Gradually, the young are forced to forage for themselves. Little is known of post-fledging behavior in Montana, but information from other areas indicates that newly independent young range widely. As an example, a fledgling was observed at Hebgen Lake near West Yellowstone, Mont., last summer which had been banded earlier that year as a nestling on the Texas Gulf Coast.

Since 1980, Montana's bald eagles have fledged at least 271 young. The rate of productivity has been good, with an average brood size of 1.85 young per successful nest. Nesting success has ranged from 67% to 76%, considered excellent performance when compared with bald eagle nesting populations in other parts of the country.

But growth of the nesting population depends on much more than simple productivity. Bald eagles usually become sexually mature at 4 to 5 years of age. Consequently, many of the young fledged in recent years have not yet entered the breeding population. These immature eagles must learn to avoid hazards and be able to locate suitable habitats for resting, feeding, and eventually for breeding. Mortality rates are high for first-year birds, just as they are for most wild species. These rates gradually decline after the first few years of life. Survival of immatures is not only important for expansion of the breeding population, but also for replacement of adults lost to natural mortality or the previously mentioned causes.

Each year, several nests or nest trees are lost in Montana. Trees and nests lost to natural causes are not generally cause for concern—bank erosion or structural weaknesses such as rot can cause a tree to fall over; wind may blow trees down or blow nests out of trees; snow on nests may cause supporting branches to break. Bald eagles can live with this degree of risk and usually respond quickly by building a new nest, often in a different tree, but usually in the same timber stand and nearly always within the same breeding territory.

This underscores the need to manage bald eagle nesting habitat on the basis of timber stands and associated water. An ongoing supply of potential nesting trees is necessary to maintain the long-term integrity of nesting territories. Bald eagles seem to achieve their greatest nesting density near coastal areas. States like Alaska, Washington, Oregon, and Florida have the highest number of nesting pairs. The Great Lakes states also have high nesting populations. The bald eagle's relationship to the sea eagle genus helps explain its propensity for coastal areas. It is no wonder the Montana bald eagle nesting population is so tied to the state's lake and water resources.

Because of this, aquatic habitats must be free of pollution, sedimentation, and toxicants. Contaminants of particular concern are heavy metals and pesticides which may cause direct mortality or physical impairment, which in turn could affect overall reproductive potential. Nesting bald eagles also need stands of mature and old-growth timber near water, and adequate security. With these requirements in mind, the Montana Bald Eagle Working Group has developed a set of recommendations for management of bald eagles and their habitat, such as developing site-specific plans for nesting territories to ensure the continued integrity of currently used habitat. The working group, composed of representatives from state and federal agencies and private interests, has also suggested procedures and standards for maintaining suitable, potential habitat not now occupied but which could be used as Montana's breeding bald eagle population expands.

Although steamboats no longer ply the waters of the Missouri and Yellowstone, some forms of habitat alteration continue and even may have increased. This trend could further reduce the availability of suitable nesting habitat for bald eagles in Montana. The primary causes of habitat loss or degradation are river impoundment, logging around nest sites, subdivision, and human recreation activities which disturb nesting bald eagles. Even though the bald eagle population appears to be increasing in Montana, the long-term carrying capacity may actually be decreasing. Positive steps are necessary to assure secure bald eagle habitat for the future.

For over 200 years, the bald eagle has served us well as our national symbol. As the species gradually recovers from effects of past environmental abuse, more and more Americans will have increased opportunity to see and appreciate this remarkable bird. In Montana, responsible stewardship of our forests and waters will help ensure that the American bald eagle continues to fill its niche in nature and, for centuries to come, continues to symbolize freedom. ■

Good Times In The Badlands

Prickly pear cactus flower: MIKE ADERHOLD

Short-horned lizard: LEE GRAVES

by Beth R. Riggs

The station wagon had barely clattered to a stop, and the excited children were already off. "Since I'm supposed to be leading this group, I better hurry and catch up," I thought. If anything could burn up some of their excess energy, it would be a hiking trip into the Makoshika State Park badlands. We were outfitted with water bottles, sun protection, hats, and a map. The crystal clear blue sky and light-colored cliffs glowed brightly. I caught the attention of Sara, Laura, Alex, and Freddy long enough to tell them to keep me in sight and to watch out for rattlesnakes. They agreed, then dashed down the Cap Rock Trail, up the Cap Rock Trail, and off the Cap Rock Trail to explore, while I moseyed along at my own pace.

* * * * *

The Sioux called this maze of bare and tortured rock "maco sica" meaning "badlands," or "stinking earth." In 1864, General Sully described it as "hell with the fires out," and the badlands have also been called the "bleeding sores of the earth." Badlands are barren areas in which soft sedimentary rocks are being eroded constantly into a chaos of weird shapes: battlements, pinnacles, spires, haystack buttes, fluted ridges, and geological debris.

* * * * *

"Hey, Beth, what are these mushroom rocks?" The kids were stopped in front of some "cap rocks." I suggested they feel the stems and caps to see if there was any difference. Four small pairs of hands reached out to feel. Sara, her big, brown eyes curious, caught on quickly. "The stem is real soft, while the cap is hard."

"Right," I said. "As the rain, snow, and wind hit the softer stem, it washes or erodes away, leaving the

Badlands near southeastern Montana's Powder River: KRISTI DUBOIS

more resistant cap to stand. Erosion is happening all around us; as the buttes wash away, sinkholes appear in the....'' I didn't quite finish before the kids were zooming down the trail again.

* * * * *

Badlands, consisting of buttes, ridges, and mountains, often form the higher ground above the prairie flatlands. Other areas have been cut and dissected by rivers, resulting in what appears to be an endless maze of broken hills, gullies, coulees, and hidden chasms.

Badlands are characterized by rapid and constant erosion. Sides of buttes are continually washed away, spires disintegrate, cap rocks precariously balance on their pedestals, and sinkholes appear in hillsides. The myriad shapes are created by the varying hardness of sedimentary rocks.

* * * * *

''Hey, Beth, look at what we found.'' Laura, smiling and giggling, had discovered a chunk of light-colored sandstone. All over the crumbly sandstone were the brown imprints of leaves.

''These are fossils,'' I explained. ''The imprints of once-living things in rocks. Just like your handprints in the front driveway, leaves were pressed down into this rock while it was still soft. As it hardened, it took on the lines of the leaves.''

We admired and left them where we had found them. Because Makoshika is a state park, it's illegal to remove natural objects. But even more than that, I knew someone else would follow this trail and see and appreciate the leaf imprints right where they had been made millions of years ago.

* * * * *

The Montana badlands originated in the Mesozoic Era, starting some 200 million years ago. Large inland seas, marshes, swamps, and broad rivers covered eastern Montana. These surface waters deposited various kinds of sediments in horizontal layers. Then, much later, internal forces in the earth buckled and heaved, causing the surface to break and tilt. A good example of this is the Cedar Creek Anticline, which partially underlies Makoshika State Park. It represents a northwest to southeast fold in the earth's surface that extends about 150 miles. Eons of erosion have worked over the ancient sedimentary rocks creating the fantastic forms.

Mule deer: STEVE WIRT

Many of the ridge tops and buttes in the badlands make up the Fort Union Formation which was laid down during the Paleocene Epoch, 65 million years ago. This layer was first described near old Fort Union in northeastern Montana. The Fort Union sediments are yellowish and banded by layers of coal.

Below the Fort Union Formation, we could see the Hell Creek Formation, laid down during the Cretaceous Period. The name Hell Creek comes from a locality in Garfield County where it was first described. The Hell Creek Formation is brownish grey. The line separating these formations was laid down about 63 million years ago, and is not always easy to see. It is the lowest and most continuous coal seam that appears near the top of the buttes. The most significant difference between the two layers is the fossil composition. The lower Hell Creek Formation contains dinosaur fossils, while the upper and newer layer doesn't.

Most scientific interest in Montana's badlands has focused on the fossil history (see *Montana Outdoors* articles in the July/August 1980 and July/August 1982 issues). The Hell Creek beds near Jordan produced the first and most perfect skulls of *Tyrannosaurus rex.* These huge carnivores once stalked their prey in the Makoshika State Park area.

Not just dinosaurs have exposed their bones to weathering in Montana's badlands. So have mammals. A site east of Fort Peck Reservoir has yielded the teeth of an ancient primate, *Purgatorius,* which showed that primates lived much earlier than had been expected—some 65 million years ago. Current studies continue on the duck-billed dinosaur nesting area near Choteau and on the Cretaceous to Paleocene transition near Jordan.

Dr. R.S. Hiatt, a retired optometrist living in Glendive, ''went nuts,'' as he describes it, on fossils 20 years ago. Hiatt has become the foremost authority on Makoshika State Park, especially its fossils, and offers a spring fossil class through the Glendive City Recreation Program. With confirmation from other paleontologists, he has found the teeth of ancient mammals; dinosaurs such as *Tyrannosaurus rex, Triceratops,* and *Hadrosaurus;* shell fragments from turtles; scales of gar fish; vertebrae from amphibians; and a crocodile skull.

* * * * *

We had been climbing steadily and reached the top of a dry, red-banded butte. We stopped to take a drink of water and look out at the buttes and maze of canyons. There were some bench lands, too, marked by a green sweep of prairie grasses. Alex asked if Indians used to live here.

I explained they didn't actually live here, but used the badlands for hun-

SHARON L. DUPUIS

A hike through Montana's badlands offers the chance to see erosion in motion, to study the area's fossil history, and to view wildlife. Dr. R.S. Hiatt, Glendive, Makoshika State Park's No. 1 expert on fossils, is pictured at right.

ting. The Plains Indians drove buffalo over cliffs or into box canyons where they could be more easily killed. The Indians also found porcelanite, a hard stone formed when shale was baked by burning coal seams. They worked this stone into arrowheads and scrapers.

The Crows often sought visions in the badlands. When a Crow was deliberating about a problem, or was feeling ambition to do something great, he would climb to a high place and not eat or drink for four days, and hope for a spiritual vision. With that, Laura asked for a peanut butter and jelly sandwich.

"What did the Indians see in their visions?" Alex asked, as we passed the sandwiches around.

"Often they saw wild animals like eagles, buffalo, grouse, lizards, and bighorn sheep," I answered. "The animals would sometimes reveal the

future, or give the seeker great powers, or give the seeker a new name. For example, there is the story of a poor Indian boy who had a cruel stepfather. The stepfather threw the boy from a cliff like the one we are sitting above. The boy fell onto a ledge where there was a pine tree. For days, in the sun and the wind, he clung to the tree. Finally a great creature, Big Iron, pitied him and sent four mountain sheep to rescue him. Big Iron gave the boy lessons on how to control the thunder and lightning, and also his name, Big Iron. The boy then returned to his people and became a great medicine man."

* * * * *

With the end of the story, my energetic friends were ready to go again and we climbed down from our butte. We walked out onto a bench with deep, waving prairie grasses. Some grazing antelope stopped when they heard the children coming. They looked at us, then loped away, becoming part of the sagebrush and wind.

Many prairie animals find a toe hold in the badlands. Some mammals take refuge in the rough country from storms or hunters. Many mule deer seem to disappear into the badlands during hunting season. However, there was not enough security for wolves, bison, plains grizzly bears, or Audubon bighorn sheep which have been eliminated from Montana's badlands.

Today, some bighorn sheep range in the Missouri River Breaks and in other river breaks in southeastern Montana. These animals came from transplants made by the Department of Fish, Wildlife and Parks. They prefer the roughest country, so they are rarely seen.

The badlands are home to many small mammals. Prairie dogs burrow in the grassy flats and bark at passers-by. Jackrabbits appear from nowhere and then scurry away like frightened ghosts. Chipmunks dash about among the few trees. Many kinds of mice are most active at night, so are seldom seen.

Bushytail woodrats use broken sandstone outcroppings as home bases. These "pack rats" have a furry tail like a squirrel and build nests of twigs, leaf blades, bones, feathers, and other "found" objects. The rock wren and Say's phoebe also use these rock outcroppings for nest sites. Predators, such as hawks, eagles, owls, foxes, coyotes, and bobcats, survey the badlands during hunting expeditions.

* * * * *

"Hey, Lizzie, wait for me!" Freddy sang out as he bounded over rocks in pursuit of a little sand lizard. Freddy was successful, and he brought a seven-inch lizard for us to examine. It was covered with silver-grey scales and had lively eyes and tail. Freddy had plans to take "Lizzie" home in his knapsack, but I vetoed the idea. The other children decided "Lizzie" would be happier in Makoshika eating her familiar bugs and cooling off under a shady rock rather than being confined in a house.

* * * * *

Several snakes live in the badlands, including the infamous prairie rattlesnake. However, I had seen them before and if not provoked or disturbed, they were easily avoided. Rattlesnakes and racers den up together in certain locations; when they decide to emerge, wonderful tales of "moving buttes" also emerge.

We rounded a butte and in front of us soared some dark birds—turkey vultures, locally known as buzzards. About 100 of them were gathered in two big pines and on the ground. We couldn't figure out what brought them together. To me, they epitomize the badlands, ancient and eerie, but fascinating all the same. Dark-feathered, with bare red heads, they soar for hours and great distances in eastern Montana.

Turkey vultures nest in caves, rocky outcrops, and cliffs in the badlands (see *Montana Outdoors*, March/April 1982). They use Makoshika as a staging area for migration. The bare, warm ridges of the Cedar Creek Anticline provide updrafts which make the job of soaring easier. The high perches make it easier to scout the landscape for scavenging or other "buzzard business."

"Yuck!" chimed my companions.

* * * * *

We stopped on a rocky hillside in the shade of some pines and junipers for another drink of water. This time, I asked a question: "How come there are trees growing here and not out on the flat grasslands?"

The children were quiet for just a bit before Sara came up with an answer. "There is less wind here and more rocks, and less grass," she said.

"Right," I said. " The trees root where there is rockier soil and where water accumulates. They do best on the north side of hills because there is more available moisture, away from the drying sun."

* * * * *

I could have continued, but the children were off again. Maybe later I could explain how badlands provide protection from prairie fires which discourage the growth of trees.

They would also learn that early ranchers and homesteaders traveled to the badlands for fence posts. Badlands cedar (actually juniper) made excellent, durable fence posts, even if somewhat crooked.

* * * * *

"Yeeeeeow!" sounded up front and I dashed ahead, imagining the worst. Much to my relief, but Freddy's discomfort, he had run through some prickly pear cactus on one of his off-trail explorations. While we extracted cactus spines from Freddy's ankles and knees, I admired the glorious yellow-waxy blooms with red centers on the prickly pear. Alex stayed to help.

* * * * *

I explained how early settlers made jelly and jam from the red pulpy fruits of the prickly pear, and I also noted the spiny thick stem is a water reserve for the plant.

We were very close to some spiny yucca. This plant has a tough, sharp, and uninviting exterior like the prickly pear—and, for that matter, like the badlands themselves. I told the children how Indians used the fibrous leaves of the yucca for baskets, sewing, brooms, and rope. The roots produce a foamy juice which was used as soap; the settlers called it "soap weed."

Freddy and Alex didn't wait for any more explanations; they were running again.

Finally, we returned to the familiar: the chrome and cushioned car. It was a welcome sight to me, especially the comfortable seats, but the children looked like they could have started out all over again. We stopped, and looked back at the setting sun. The sky was glowing orange and red, while the hills were turning somber purple-black. I didn't need to make any more explanations; the badlands were speaking for themselves. ■

Bighorn Permit Goes for $79,000

When Oregon film producer Arthur R. Dubs offered the high bid for Montana's first bighorn sheep auction permit, he not only secured for himself one of the finest opportunities to hunt a trophy bighorn ram on the North American continent, he also nearly doubled the amount of money available for bighorn sheep management programs in the state.

Dubs obtained the permit for $79,000 at an auction sponsored by the Foundation for North American Wild Sheep at the group's national convention in Honolulu. For his money, Dubs will be able to take a three-quarter curl or larger bighorn ram in any sheep hunting district during the 1986 season. His bid was a record for a state-offered auction permit, surpassing the previous record of $67,500 paid for a Nevada desert bighorn sheep permit last year.

"The institution of the auction permit and the money this and future permits will generate for sheep management in the state will be a real plus for our program," said Glenn Erickson, chief of special projects for the department's Wildlife Division. Erickson explained the money will play an important part in helping the department meet bighorn sheep management objectives: increasing research efforts, protecting and preserving key bighorn habitat, and transplanting bighorns into suitable, unoccupied habitat.

"Intensifying land uses are decreasing the quality and quantity of bighorn sheep habitat in Montana," Erickson continued, "so we see a real need to learn more about the sheep we have and to protect the habitat they require. Mr. Dubs' contribution to the program will be a definite asset in working toward these goals."

Bear Us in Mind

Grizzly bear country is a unique and special place. In the lower 48 states, it is the last domain of a magnificent animal—a vanishing symbol of our natural heritage. It is the only place where man is not necessarily the dominant species.

Grizzlies once ranged throughout most of the western United States. Today, fewer than 1,000 grizzly bears survive in the wild areas of Montana, Wyoming, Idaho, and Washington.

The grizzly is listed by the U.S. Fish and Wildlife Service as a threatened species, one which may become endangered unless conservation measures are carried out that minimize bear-human conflicts. All bears are powerful and potentially dangerous, yet you can enjoy backcountry, provide for personal safety, and usually prevent bear-human conflicts by taking a few precautions.

Food and odor attract bears.

Keep a clean camp and store food and garbage properly *at all times*. Store food in your car trunk, if possible. Otherwise, place food in a bag, backpack, or pannier and hang from a tree branch at least 10 feet above ground and four feet out from the tree trunk. Do *not* store food in tents.

Deposit garbage in bear-proof containers where available, or pack it out. Never bury it.

Avoid cooking smelly or greasy foods. Sleep some distance uphill from your cooking area and food storage site. Keep sleeping bags and personal gear clean and free of food odor. Don't sleep in the same clothes you wore while cooking.

Store odorous products as though they were food. Don't use perfumes or deodorants. Women may choose to stay out of bear country during their menstrual period.

Where hunting is permitted, keep game meat out of reach of bears. Dispose of fish entrails by puncturing the air bladder and dropping in deep water where they will decompose naturally.

Horse pellets should be stored the same as food.

Bears don't like surprises.

Use caution where visibility or hearing is limited. Make your presence known to bears by singing, talking, wearing bells, or making other noises. Travel in groups. Do not hike after dark.

Be alert. If you notice bears, dead animals, or bear signs such as tracks, droppings, or diggings, choose another area.

Dogs can disturb a bear and lead it back to you. If dogs are permitted in the area, don't allow your dog to run free.

Bears are wild animals.

Bears usually avoid people, but their responses are unpredictable. A female may be quickly provoked if her cubs are disturbed or if you come between the cubs and her.

If you spot a bear—but it doesn't see you—avoid it by quickly and quietly leaving the area.

If you encounter a bear...

Even if you have taken all precautions, you may still encounter a bear. If you do:

- Stay calm. It will probably leave you alone. Do not make abrupt moves or noises that would startle the bear.
- Give the bear plenty of room. Slowly detour, keeping upwind so it will not get your scent and know you are there. If you cannot detour, look for a climbable tree while waiting for the bear to move away from your route.
- If a grizzly bear charges, your options are: drop a pack or coat to distract the bear; climb at least 12 feet up a stout tree; as a last resort, assume a "cannonball'

graphics: DIANA HAKER

position to protect your head and stomach while playing dead.

Because grizzlies can attain bursts of speed up to 40 miles per hour, running away is a poor option.

Understanding grizzlies can reduce your chances for conflict and help conserve the bears.

The grizzly has a low reproductive capacity because: (1) females may not breed until 5-8 years old, and (2) females take care of their cubs for two to three years, during which time no other young are produced. If too many grizzlies are killed, the bear population will decrease and may face extinction.

Grizzly bears are very powerful and possess a tremendous sense of smell, good hearing, but poor eyesight. A grizzly learns quickly and has a good memory.

Preventing bear-human conflicts is the key. Don't let your carelessness cause the unnecessary death of a bear.

Trout Foundation Seeks Proposals

The Montana Trout Foundation (MTF) is inviting groups or individuals to apply for funding for grant proposals. The MTF (formerly the Foundation for Montana Trout) is a private, nonprofit foundation.

The foundation's objectives include: (1) "to preserve and enhance the wild trout resources of Montana by the encouragement, support, and funding of meaningful projects," and (2) "to engage in other educational activities to create a better awareness of the need for, and the value of, improvement and maintenance of open spaces, of wild trout habitat, and of the natural environment, whether public or private, with emphasis on preservation of water quality and the prevention, detection, and correction of water pollution."

A Grants Committee will review and rank proposals and recommend action to the foundation's board. Last year, MTF funded projects ranging from restoration of habitat for wild trout in an urban setting to studies of the habitat requirements of river-dwelling Arctic grayling.

Deadline for submitting proposals is Aug. 1. Project guidelines are available from Arthur B. Coffin, chair, Grants and Awards Committee, Montana Trout Foundation, 908 S. Willson Ave.; Bozeman, MT 59715.

Managing the Grizzly Bear, *continued from page 32*

control hunts. (3) On an experimental basis, augmenting the grizzly population in the Cabinet-Yaak Ecosystem and other areas by transplanting or cross-fostering (placing grizzly cubs born in zoos in dens with black bear mothers in the wild). (4) Shifting recovery efforts from the Northern Continental Divide Ecosystem, where the bear population is currently healthy, to other ecosystems such as the Selway-Bitterroot and Cabinet-Yaak, where the grizzly *is* threatened, or the Yellowstone, where the grizzly may be threatened.

The EIS also cautions that continued success of the grizzly management program in northwestern Montana will depend to a large degree on maintaining suitable habitat. Subdivision, gas and oil exploration, logging in key areas, recreational development, and road building can adversely affect grizzly habitat and make the bears more susceptible to various forms of mortality. Habitat alteration, left unchecked, may set in motion an irreversible sequence of events that will be detrimental to grizzly bear populations.

At present, however, the grizzly bear population in the Northern Continental Divide Ecosystem appears sufficiently healthy to qualify for removal from "threatened" status under the Endangered Species Act. This is indicated primarily by the fact that the current population estimate—549 to 813 bears—is at or above the recovery goal of 560 bears set for this ecosystem in 1982 by the Grizzly Bear Recovery Plan. This document was prepared by the U.S. Fish and Wildlife Service in cooperation with the DFWP as mandated by the Endangered Species Act.

Other indicators that the Northern Continental Divide population is healthy include the relatively high bear density, which compares favorably with that of other populations in Canada and Alaska, the above-average reproductive characteristics, and the acceptable mortality rate.

Recent increases in the number of depredation problems and resulting control actions along the Rocky Mountain Front emphasize the need for greater management flexibility than is currently being provided by provisions of the Endangered Species Act. Because of the grizzly's potential to cause human injury and substantial property damage, it requires management strategies different from those of other species listed under the act. It is important to remember that grizzly bears will prosper in areas inhabited by people only to the extent that their presence is tolerated. The management program proposed in the EIS promises to meet the needs of grizzly bears in northwestern Montana while at the same time protecting the safety and property of their human neighbors. ■

1985

Montana's fishing statistics for 1985 had a few unusual twists. First, Ray Quigley of Great Falls—who held *three* state records at this time last year—lost two of them (the shovelnose sturgeon and the stonecat), but his 4.68-pound shorthead redhorse sucker was added to Montana's record list. Quigley caught the redhorse near Loma on the Marias River.

And Fred Perry of Malta set a new record for white sucker. But check last year's record under that category and you'll see: **Fred Perry.** As far as we know, Perry is the only record holder to have "bested" his own effort. His 1981 white sucker weighed 4 pounds, 5 ounces; the fish added to this year's list was caught in 1983, and weighed 5 pounds, 5⅓ ounces. (Because of incomplete information on the official form, the 1983 fish wasn't added to the record until 1985.) Both were taken at Nelson Reservoir.

Other new records for 1985 include the 17.55-pound freshwater drum taken from Fort Peck Reservoir by Dean Johnson of Glendive; the 7.09-pound northern squawfish taken from the Lower Clark Fork River by Jim Conlin, Thompson Falls; the pumpkinseed, taken by Tim Colver of Troy, weighing just under a pound (.95) and taken from Milnor Lake; the shovelnose sturgeon, taken by Ernie Penner of Ulm, weighing 13 pounds, 4 ounces, and taken from the Marias River near Loma; and the .42-pound stonecat, taken from the Milk River by Robert M. Garwood, Havre.

What do you do if you think you've caught a record fish? The Department of Fish, Wildlife and Parks requires that you (1) harvest the fish legally, (2) weigh it on an inspected scale (most grocery store scales are inspected), (3) have the fish positively identified. *Whenever possible,* that means verification by department personnel. If you can't find a department employee, you must present a photograph from which the fish can be identified; with some species, this is difficult. If you didn't have a department employee weigh the fish, you must present documentation from the store where it was weighed.

As you set off for your fishing adventures this year, remember that records—especially fishing records— are made to be broken. Good luck in doing so! ■

FISHING RECORDS SUMMARY

Species	Weight lbs.	Weight ozs.	Angler	Year	Location
Arctic grayling	2	10	Mark Daniels	1974	Handkerchief Lake
Bigmouth buffalo	32	6	Gary Lundman	1979	Missouri River (Slippery Ann Game Station)
Black bullhead	1	11	Mike Mitchell	1977	Horse Creek (McCone Co.)
Black crappie	3	2	Al Elser	1973	Tongue River Reservoir
Bluegill	2.64		Brent Fladmo	1983	Peterson's Stock Dam
Blue sucker	6.05		Ray Quigley	1984	Marias River at Loma
Brook trout	9	1	John R. Cook	1940	Lower Two Medicine Lake
Brown trout	29	0	E.H. "Peck" Bacon	1966	Wade Lake
Bull trout	25	10	James Hyer	1916	unknown
Burbot (ling)	13	4	Paul Keller, Ernie Schutt	1980	Missouri River (below Fort Peck Dam)
Carp	38	4	Craig Dyer	1983	Eyraud Lakes
Channel catfish	25.89		Gordon Wentworth	1984	Fort Peck Reservoir
Coho salmon	4	14	Irven Stohl	1973	Fort Peck Reservoir
Cutthroat trout	16	0	William D. Sands	1955	Red Eagle Lake
Freshwater drum*	**17.55**		**Dean Johnson**	**1985**	**Fort Peck Reservoir**
Golden trout	3.14		Terry Cameron	1981	Inlet, Lake At Falls
Goldeye	2	9	Lester Estenson	1977	Nelson Reservoir
King salmon (chinook)	4	7	Barry Gillis	1972	Missouri River
Kokanee (salmon)	5	15	Forrest Johnson	1976	Pishkun Reservoir
Lake trout	42	0	Dave Larson	1979	Flathead Lake (east shore)
Lake whitefish	5	8	James Sellen	1981	Echo Lake
Largemouth bass	8	2½	Juanita A. Fanning	1984	Milnor Lake
Mountain whitefish	4	9¾	Mike Hangas	1977	Blackfoot River
Northern pike	37	8	Lance Moyler	1972	Tongue River Reservoir
Northern squawfish*	**7.09**		**Jim Conlin**	**1985**	**Lower Clark Fork River**
Paddlefish	142	8	Larry Branstetter	1973	Missouri River
Pallid sturgeon	60	0	Gene Sattler	1979	Yellowstone River
Pumpkinseed*	**0.95**		**Tim Colver**	**1985**	**Milnor Lake**
Pygmy whitefish	0.16		Orlin Iverson	1982	Ashley Lake
Rainbow trout	20	0	C.J. Brohaugh	1952	Cliff Lake
Rainbow-cutthroat hybrid	30	4	Pat Kelly	1982	Ashley Lake
Sauger	7	2	Raymond V. Johnston	1975	Tongue River Reservoir
Shorthead redhorse sucker***	**4.68**		**Ray Quigley**	**1985**	**Marias River near Loma**
Shortnose gar	3	1	John Johnson	1977	Fort Peck Dredge Cuts
Shovelnose sturgeon*	**13**	**4**	**Ernie Penner**	**1985**	**Marias River near Loma**
Smallmouth bass	4	11½	Bob Higson	1975	Horseshoe Lake
Smallmouth buffalo	9	4	Mac McKinney	1977	Hauser Lake (west side)
Stonecat*	**0.42**		**Robert M. Garwood**	**1985**	**Milk River at Havre**
Walleye	14	0	Neil Berg	1974	Nelson Reservoir
White crappie	2	2	Drew Jackson	1978	Tongue River Reservoir
White sturgeon	96	0	Herb Stout	1968	Kootenai River
White sucker**	**5**	**5⅓**	**Fred Perry**	**1983**	**Nelson Reservoir**
Yellow perch	2	0	Gerald Pottratz	1974	Nelson Reservoir

***New Montana record for 1985**
****New Montana record for 1983**
*****New to Montana's record list**

NONGAME NEWS

MORE INFO NEEDED ON BREEDING BIRDS

Much is unknown about breeding distribution of Montana's birds. To help gather more information, the Nongame Wildlife Program urges interested observers or bird clubs to plan field trips this breeding season. In the last Nongame News section *(Montana Outdoors,* March/April 1986), it was emphasized that knowledge of bird distribution in certain parts of the state is limited because observers have never documented the presence or absence of various bird species. This is particularly true for breeding birds.

As an example, latilong 37 (a latilong is a one-degree block of latitude and longitude) near Dillon has 150 bird species either known or suspected to breed. Of these, 47 lack confirmed evidence of breeding, such as an active nest or dependent young. For the Wolf Point latilong, 60 of 107 breeding species fit this category.

Plan field trips from May through July to these or other areas. Design your trip to search a wide variety of habitats on public and—*with permission of the landowner*—private lands. Take care not to unduly disturb nesting birds.

Send documentation of any new breeding records to Nongame Wildlife Program, DFWP, Research Park Bldg., Box 5, Montana State University; Bozeman, MT 59717.

FEDERAL FUNDING—THE NONGAME ACT

The Wildlife Society, a highly regarded educational and scientific organization dedicated to wise management and conservation of wildlife, is urging key members of Congress to adopt a funding level of at least $50 million per year for the Fish and Wildlife Conservation Act of 1980 (Nongame Act). The Nongame Act could provide state wildlife agencies with funds needed for nongame surveys, research, and management plans.

The Society suggests that the nongame bill establish a "semipostal stamp," with a surtax of 25% to 50% over the regular postage fee. The semipostal stamp would be voluntary, purchased by supporters of nongame wildlife. Funding studies indicate that up to $200 million could be generated.

SMALLEST MAMMAL

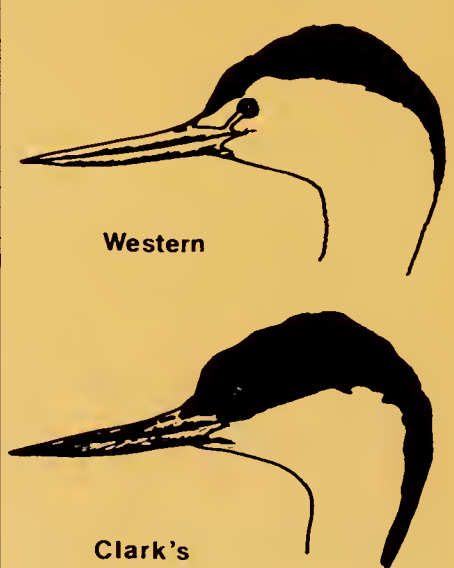
The word "shrew" often means something derogatory. But these diminutive mouselike creatures don't live up to their name. Instead, they are better candidates for the "Guinness Book of World Records." The pygmy shrew, the smallest North American mammal, weighs no more than a dime. The water shrew has long, stiff hairs on its feet which enable it to run on top of water for short distances. Water shrews are also excellent swimmers and divers.

Although they resemble mice, shrews are not rodents. They belong to a group of mammals called "insectivores." Shrews dine on a variety of insect pests, including grasshoppers and caterpillars. They also eat mice, salamanders, fish, fungi, and plants. Shrews must eat tremendous amounts of food because of their high metabolism. A captive masked shrew had a recorded heart rate of 1,200 beats per minute, and ate more than three times its weight daily. Some shrews must eat every three hours to survive. They have poor eyesight, and rely on keen senses of smell and hearing to capture their prey; some may even use echolocation, in a way similar to bats.

Montana has nine species of shrews. Four, including the pygmy, are listed as species of special concern because of their limited distribution and lack of information about their abundance and specific habitat needs. Others, such as the masked shrew, are common and widespread in a variety of habitats statewide.

WESTERN GREBE NOW TWO SPECIES

The sixth edition of the "AOU Check-List of North American Birds," issued in 1983, listed the western grebe as one species, *Aechmophorus occidentalis,* but noted that two color "morphs" existed, "light-phase" and "dark-phase." Based on more recent research, the AOU (American Ornithologists' Union) recently split these two color phases into two species, giving the dark-phase birds the name Clark's grebe (*Aechmophorus clarkii*).



Clark's grebes differ from western grebes in bill color and in the amount of black feathering on the face (see illustration). Clark's grebes have a dark greenish-yellow bill, compared with the orange-yellow bill of the western grebe. The striking red eye of the western grebe is surrounded by white feathers; in the Clark's grebe, black feathers extend below the eye.

The decision to split these species was based on research in California, Oregon, and Manitoba, which showed the two forms differ not only in plumage, but also in behavior. Where the two species coexist, interbreeding occurs in only about 3% of the pairs. Researchers also found that males respond only to the unique courtship enticement calls of females of the same color phase. Evidence also emerged that shows that light-phase (western) grebes feed farther from shore in deeper water than dark-phase (Clark's) grebes.

Status of these two species has not been well documented in Montana, although "western" (one or both species) grebes occur throughout the state. Clark's grebes are likely common here, since they tend to be distributed farther north than the light-phase birds. If you have information about distribution of these two species in Montana, contact: Nongame Wildlife Program, DFWP, Research Park Bldg., Box 5, Montana State University; Bozeman, MT 59717.

GOOD READING

There's a Bat in the Attic and a Woodchuck in the Garden, by Richard A. Patterson, Indian Creek Nature Center, 6665 Otis Road S.E.; Cedar Rapids, IA 52401, 1985, 30 pages, $4.50. Methods of reducing wildlife problems in suburban homes and yards.

Montana's Explorers—The Pioneer Naturalists, by Larry S. Thompson, Montana Magazine, Inc., P.O. Box 5630; Helena, MT 59604, 1985, 109 pages, $13.95. Interesting look at Montana before settlement.

Hummingbirds: Their Life and Behavior, by Esther Q. and Robert A. Tyrrell, Crown Publishers, Inc., 1 Park Ave.; New York, NY 10016, 1985, 224 pages, $35. The most complete compilation of information on hummingbirds available, and the best array of hummingbird photos ever published.

SPENCER E. TURNER

MISSOURIANS ON THE MADISON

Turner and Vance give the Madison a chance.

by Spencer E. Turner

"Put it behind the rock," Jerry said.

Following orders, I flipped the Bitch Creek nymph behind the boulder as Jerry rowed back against the Madison River's surging current. I sensed a hesitation as the fly swirled in the eddy and tightened the line.

The trout headed for midriver, stripping line. It wasn't my first trout from the Madison, but it was the biggest.

This trip began long before it actually started—back in 1979 when I listened to Ron Marcoux, than Region 3 (Bozeman) fisheries manager for the Montana Department of Fish, Wildlife and Parks, talk about the Madison River trout fishery at a wild trout symposium in Yellowstone National Park.

For an old Missouri fisheries biologist, the Madison River fishery is awesome. It has more miles of quality trout water, more trout, and more fishermen than all of Missouri's trout streams together.

The Madison is one of several blue ribbon trout streams in Montana. Its fame has come from an outstanding brown and rainbow trout population and a radical management program.

Trout fishermen rank it as the No. 1 trout stream in the country.

It begins its 150-mile run to the Missouri in Yellowstone Park, at the junction of the Gibbon and Firehole rivers. Here it is a meadow stream of pools and glides, breaking over to a rocky riffle in a stretch called Behind The Barns, then flowing on to the Beaver Meadows before leaving the park and entering Hebgen Lake.

Hebgen Lake is a 16-mile-long storage and flood control reservoir built in 1909. Before 1969, fluctuating water discharges created a boom and bust situation for fishermen and trout alike in the river below the reservoir. Periodic dewatering and large flood flows at inopportune times kept the river from reaching its true potential. Since 1969, the Montana Power Company, which operates the dam, has managed flow releases to provide for year-round requirements of the trout population.

From Hebgen, the river enters Earthquake Lake, which was formed in 1959 by a gigantic earthquake. When the quake wrenched the Montana mountains, it triggered a landslide, filling Madison Canyon and diverting water to the freshly opened wound that now is Quake Lake.

Below the lake, the river falls for some 40 miles of riffle before slowing and spreading out into braided channels at the head of Ennis Lake.

Leaving Ennis Lake, the river continues its long run to the Missouri, but here it's a different river—warmer, slower in some sections, faster in others, home to many species of fish.

My cohort, Joel Vance, and I decided to fish the middle section this time. I've fished the Madison before, but not outside Yellowstone Park. We headed for the no-kill section upstream from the West Fork of the Madison.

Before I could wet a line, I heard the sound of a generator, and presently a small boat came into view from behind an island. Two men rode in the boat and a third waded, holding the boat in the strong current. The bow man was throwing a pole ahead of the boat, trailing a long electrical cord, then pulling it back. The second man had a long-handled net. As I watched, he dipped several trout that followed the pole back to the boat and placed them in a tub of water.

Electrofishing isn't legal for most fishermen, but it was for these. We watched Dick Vincent's stream sampling crew finish and land in front of us to measure and weigh the browns and rainbows they'd collected. Dick is the fisheries biologist responsible for managing the fishery of the Madison River and several other streams in the region. The crew also counted hooking scars and marked each trout with a fin clip for later identification before releasing them, unharmed, back to the river.

I do this sort of work myself back in Missouri. I indulged myself in a busman's holiday for a few minutes and looked over their catch. I was amazed at how many trout—some over four pounds—they'd caught from the short section of river and also at the number of hooking scars. Many had been caught and released three and four times—attesting to the vulnerability of the trout as well as their durability.

After they left, I picked up my fly rod and began wading downstream, fishing a zug bug. I learned quickly that wading the Madison is entirely different from wading my home trout streams in Missouri. The current's swifter and the rocks slipperier. I began to understand why the stream sampling crew all wore cleated wading shoes.

I fished my way downstream to an island, intending to work along its edge to an eddy at the lower end. As I fished, I watched an elderly gentleman, decked out in fly vest and fishing hat, pipe stuck firmly in his mouth, work his way across the heavy riffle from the left bank to the island—cutting me off from fishing the eddy.

Being the mannerly sort, I let him have the eddy and began working my way across the riffle, where he'd just crossed. If he could do it, so could I.

Damn, that water is cold. I went swimming twice before reaching the bank. So much for the grace and dexterity of youth.

Fishing was slow. Joel caught a nice brown of 12 inches or so on an Adams and I broke off a sizable trout trying to land him too soon. We both looked forward to floating the next day with regional fisheries biologist Jerry Wells.

We waited for Jerry the next morning at McAtee Bridge, visions of a classic float down the Madison in a McKenzie river boat occupying our thoughts. An old pickup with a johnboat on top rattled down the road and turned into the parking lot. Jerry introduced himself. I knew we'd met a kindred spirit. The boat—a Loweline johnboat made in Lebanon, Mo. All Jerry lacked was catfish rods and stink-bait in the back of the truck. He drove us upstream in his truck to Lyons Bridge. This section of the Madison has no-kill regulations, but you can fish from a float boat. The section we'd fished the day before was restricted to wading only.

We arrived at the access about 11 a.m., unloaded Jerry's 14-foot johnboat and rigged our fly rods. A number of boats and guides put in ahead of us, but Jerry was in no hurry to start. He wanted the majority of the boats to get ahead of us. The best fishing, he explained, is in the late afternoon and early evening, after most guided fishermen are off the river.

There's a message here: For your first trip on the Madison, I'd recommend a fishing guide, and if you're going to float, request an afternoon trip, ending at dusk.

The sun was high as we left the access and floated under Lyons Bridge. During the drive over, Jerry asked what fishing gear we'd brought. When he found out we were both fly fishermen, he suggested using floating lines with leaders tapering to 4- to 6-pound tippets. This seemed a little heavy but I soon learned Jerry knew what he was doing.

"What flies do you recommend?" I asked.

He handed me two of the biggest, ugliest nymphs I've ever seen.

They were take-offs on a Bitch Creek nymph pattern, tied on No. 6 hooks. They had pink rubber legs and orange bellies, and weighed about a quarter-pound each. Casting them with my light trout rod wasn't going to be easy. I soon learned short casts (more like lobs) were the order of the day.

We floated downstream with Jerry working the oars, holding the boat back against the current. We fished along the edge of the river, allowing the nymphs to float under the overhanging willows and behind rocks and boulders in the eddies.

I learned quickly that fishing from a drift boat was considerably different from wading and fishing.

"Strike!" Jerry yelled at me.

I was only about 10 minutes late. The fish was gone.

"You've got to keep your line tight," Jerry explained. "Raise the tip at the slightest hesitation in the drift."

I followed his instructions and hit a trout in the next eddy, landing the small brown, my first of the day.

"That's better, but you're still not doing it right. The minute you feel the fish on, you give the Marcoux yell at the top of your lungs, echoed by everyone in the boat," Jerry instructed. "This makes everybody on the river think you're the best damn fishermen in the world."

We finally caught on and landed several medium-sized browns and rainbows and a few whitefish, yelling ourselves hoarse in the process.

We used a number of different fly patterns—grasshoppers, royal Wulffs, muddlers, Bitch Creek nymphs, and small, grey, soft-hackle nymphs. The soft-hackle nymphs worked best early in the afternoon and took only small rainbows.

The day turned hot, and we pulled up at the mouth of a small spring branch for a lunch break of cheese, crackers, and wine. I asked Jerry about the new management program on the Madison.

"The program started in the mid-60s," he said between bites of cheese. "We were planting nearly 100,000 catchable trout on top of a wild trout population. Flow patterns out of Hebgen Lake were bad—low flows in critical periods during winter and spring.

"Biologists began wondering what effect the flows were having on the fish population. Dick Vincent was one of them. He negotiated with Montana Power Company for continuous flows of water from Hebgen Lake during the winter and spring—a critical period for recruitment of young-of-the-year brown and rainbow trout—and regulated flows during the summer. There was no young-fish habitat during the winter and spring.

"After the flows were regulated in 1969, trout numbers exploded in the river below Ennis Dam, where hatchery trout were not stocked. But up here, no response.

"This started Dick wondering. Could the problem be the hatchery trout? To find out, he stopped stocking the Varney Section. The wild trout population, both browns and rainbows, just exploded. After six years, the rainbow population had increased by 10 times, with no change in regulation."

"Why such a dramatic population change?" I asked.

"There's an interaction between the hatchery trout and wild trout in the river. They don't behave the same. We don't know what the interaction is, but one way or another, hatchery fish put a strain on the wild trout. Because of this research, the state stopped stocking all waters in the state.

SPENCER E. TURNER

Joel Vance lands a scrappy rainbow in the catch-and-release section of the Madison River.

"The browns responded immediately and reached carrying capacity in three years. The rainbows took longer—five to six years. It's a money-saver for the state, and the anglers get a quality fish, more fish and larger fish," he explained.

"This brings us up to 1976. The biologists were happy with the huge increases in the numbers of trout in the river. But the fishermen started to complain about fishing in the upper river. There were a lot of trout, but they weren't catching any big ones."

Dick began gathering data from the upper river and set up some study sections above the Varney Section, he went on to explain. There were a lot of

trout but mostly small, all under the age of 3—about 12 inches long.

"Was that from natural mortality," I asked, "or something else?"

"We didn't know then," Jerry said, taking another sip of wine. "In 1977, we closed fishing for six years from Squaw Creek to Wolf Creek. At that time, we had a 10-trout limit. In one year, the trout population doubled. In a similar section upstream, open to fishing, the population remained the same. We knew there wasn't a pollution problem; therefore, the increase in the closed section had to be from no fishing.

"We asked the Fish and Game Commission to drop the limit to five trout in all of the region's streams beginning in 1978 and proposed a catch and release area for the Madison from Quake Lake to McAtee Bridge. After the change, we compared the closed section to the catch and release section. They mirrored each other."

"What you're saying is the trout population in the Madison was adversely affected by the 10-fish limit?" I asked, "Fishermen were taking more trout than the population could support?"

"Right. We had 75% to 80% summer mortality of all trout over 13 inches before we went to catch and release fishing."

"How many fishermen fish the Madison?" I asked.

"We had more than 1,000 fishermen per mile of river at that time. When we looked at the number of fish per mile larger than 13 inches and the number of fishermen, it became apparent that if we allowed fishermen to keep even one fish, we couldn't increase the number of 13-inch and larger trout in the river. That's why we asked for a catch and release regulation. Since then we've increased the numbers of 13-inch and larger trout five times.

"Today we have more fishing pressure on the river than we've ever had—and more large trout."

The wine and cheese were gone. Time to fish the last few miles to the take-out.

The rest had done the river and us a world of good. We hadn't floated 100 yards before Joel hooked a scrappy rainbow of about 14 inches. It put on an aerial display for a few minutes before Joel brought it to the net and quickly released it.

We switched back to the big Bitch Creek nymphs, and I followed Joel's lead with the largest trout of the float. It surged out of the eddy behind the rock and headed upstream, stripping line from my reel.

"Hold him out of the brush," Jerry cautioned, moving the boat away from the bank, giving me room to play the fish.

It took almost 10 minutes and a half-dozen Marcoux yells to land the trout. As I removed the fly, I admired its beautiful muted browns and golds and the dime-sized red spots along its side.

JOEL VANCE

The Bitch Creek nymph may be one of the ugliest flies ever created, but to the trout in the Madison, it's a delicacy.

It was a brown trout, about four pounds. I held the great fish in the water, allowing it time to recover before gently releasing it back to the river.

"Good job," Jerry said, shaking my hand.

The float finished with a flurry of activity. We caught and released more than a dozen trout, and I lost count of the whitefish.

The Madison had lived up to its reputation as Montana's premier blue ribbon trout stream. Trout fishermen in Montana and elsewhere owe a debt of gratitude to professionals like Ron Marcoux, Jerry Wells, and Dick Vincent. Their concern about the quality of our sport as well as having the guts to stand up and recommend changes—regardless of how unpopular—to make fishing better speaks well for Montana trout fishermen and the future of the Madison River. ■

WADE FREDENBERG

With help from biologists, the westslope cutthroat is regaining some of its former range.

The King Returns

by Rick Hull

In its scientific name, *Salmo clarki lewisi,* the westslope cutthroat trout still bears the names of the explorers who first described it. When those first specimens with their "specks...of a deep black" and "a small dash of red...behind the ventral fins" were pulled out of the Great Falls of the Missouri in 1805, the westslope reigned unchallenged in the Montana Rockies. It was the dominant fish and the only true trout (Salmo) in an estimated 16,000 miles of streams and rivers on both sides of the Continental Divide, with a range that also included much of Idaho, Alberta, and parts of British Columbia, Saskatchewan, and Wyoming.

But the years since Lewis and Clark have been desperate ones for the former king. Dams, irrigation demands, overgrazing of stream banks, bad forestry practices, and the general pressure of human activity despoiled much of its habitat. In its remaining streams, the westslope found itself fighting for survival against a flood of hatchery fish. By the 1970s, westslope territory had shrunk by at least an estimated three-quarters, and the majority of the surviving populations were interbreeding with non-native trout. It was feared that the westslope was about to follow at least two other varieties of the cutthroat to extinction.

But recent research has shown that the native westslope cutthroat may not be the rapidly fading violet once thought. More important, locked in its genes is a secret strength that has allowed the westslope not only to survive but also to actually prevail in many mountain streams. Now Montana Department of Fish, Wildlife and Parks (DFWP) biologists are convinced they can use this hidden advantage to make the westslope once again the major game fish in an important part of its historical range.

The first step in saving the westslope was the belated discovery that it was a separate fish, with its own distinctive set of genes. For years, biologists lumped the native trout of the Northwest into two species—the rainbow, which lived below the barrier falls on the major rivers of the Pacific Northwest, and the "blackspotted trout" or cutthroat, which inhabited the Rocky Mountains from Canada to Mexico. The cutthroat was further subdivided into a dozen subspecies, ranging from the Rio Grande cutthroat of New Mexico and Colorado, to the mountain cutthroat, which lives in fewer than a dozen small streams in British Columbia. The westslope cutthroat was assumed to be nothing more than a geographical variant of Montana's other native cutthroat, the Yellowstone.

In the 1960s, biologists began to realize that Montana's cutthroat are actually two very different fish with very different ecological niches. The Yellowstone had adapted to a life in the lakes of south central Montana and Wyoming, while the westslope made the high mountain streams, lakes, and rivers of north central and western Montana its realm.

In the past two years, there has been an even bigger surprise. Researchers at the University of Montana, probing directly into the cells of the trout, have evidence that the Yellowstone is genetically a different fish from the westslope. The same research indicates the westslope and rainbow are genetically more similar than previously thought. The researchers—Robb Leary, Fred Allendorf, Stevan Phelps, and Kathy Knudsen of UM's zoology lab—say these genetic studies may overturn the traditional division that puts cutthroat on one side of the family tree and rainbow on the other. Instead, the geneticists would lump the cutthroat of the interior Rockies into a "Yellowstone group" of closely related varieties. The westslope cutthroat, coastal cutthroat, Lahontan cutthroat, and rainbow trout would be put into a second category called the "rainbow group."

The years of zoological confusion are easy to understand. It is possible for rainbow trout living in the same stream to have different numbers of chromosomes, some having 58, others 62, and occasionally even 64, while cutthroat generally have 64. On the other hand, offspring from the same

parents raised in different water temperatures can have different numbers of scales along the lateral line or different numbers of vertebrae—characteristics traditionally used by biologists to describe and identify species and subspecies of fish.

The discovery that the westslope was its own fish quickly altered planting policy. By 1970, hatcheries in northwestern Montana converted to westslope production, utilizing fish captured in Hungry Horse Creek, a small stream feeding its namesake reservoir.

But it was nearly too late. A deluge of hatchery fish had been dumped into virtually every mountain stream and lake in the west for three-quarters of a century. Railroad cars from the federal hatchery at Bozeman pulled up at sidings throughout the state and local sportsman groups picked up milk cans of young fish for planting in their favorite fishing hole. Pack trains carried more cans of fish to hundreds of alpine lakes. In 1916, a Bureau of Fisheries railroad car arrived at Glacier National Park with 75 to 100 extra cans of fry, with instructions to put them "where they will do the most good." In 1921, park officials boasted of planting 1.87 million fish, and in 1924, the superintendent complained Glacier Park hadn't received the 2 million fish promised that year. The roster of introduced fish included chinook, coho, and sockeye salmon; rainbow, brook, and brown trout; grayling; mackinaw (lake trout); lake whitefish; bass; perch; sunfish; bullheads; and more.

In the 1930s, fish managers began to have second thoughts about the wisdom of trying to duplicate East Coast and Midwest fishing in the Rockies. The emphasis shifted toward planting of native fish, such as the rainbow and cutthroat. Unfortunately, hatchery managers were still unaware of the special nature of the westslope, and instead relied on the easily tapped spawning runs at Yellowstone Lake for the bulk of their cutthroat stock. As many as 38 million Yellowstone cutthroat eggs a year were taken from the lake, raised to fry stage, and planted throughout the Northwest. Rainbow trout fry, so much cheaper and easier to produce in hatcheries than cutthroat, were produced by the tens of tons and planted throughout westslope territory.

The invasion of Yellowstone and rainbow damaged the westslope in a way not immediately apparent—all three species can interbreed. Where the westslope wasn't being pushed out, it was being diluted out—hybridized.

Hybrids have their advantages in raising domestic corn, mules, and even production fish in hatcheries. But this "hybrid vigor" occurs only when the original parental stocks are mated and it fades rapidly in succeeding generations. As in mules, often the hybrids between two fish species are sterile; this occurs in the "splake," a product of the lake trout and brook trout; the "tiger trout," from brook trout and brown trout; and crosses between brook trout and bull trout. In westslope and rainbow crosses, which may not be sterile, research has shown abnormal male-female ratios and disappointing growth rates. The huge size of the rainbow-Yellowstone-westslope hybrids in Ashley Lake near Kalispell seems to be more the result of small numbers of fish feeding on an abundant supply of small kokanee than of hybrid vigor.

In 1982, the westslope planting effort suffered a setback when deformed fins and severe mortality began cropping up at the Murray Springs Hatchery in Eureka. The problem was inbreeding in the hatchery offspring—fish from one stream simply didn't provide a large enough genetic pool to keep the broodstock

In the 1960s, biologists began to realize that the westslope and Yellowstone cutthroat were two distinct subspecies. This cutthroat, which has been tagged for study in a western Montana stream, appears to be a westslope—but positive identification requires laboratory analysis.

BILL THOMAS

healthy. Other, more diverse, sources of westslope had to be found. And that meant hunting down remnant pure-strain populations that might have survived the onslaught of hatchery fish.

At first glance, the search seemed easy. There are hundreds of isolated streams and lakes in the Flathead River system, ranging from the backcountry of the Bob Marshall Wilderness Area on the South Fork, to the undeveloped Whitefish Range on the North Fork. But research of state and federal hatchery records quickly revealed how pervasive the planting had been.

Similar searches elsewhere in the West had ended in disappointment. In 1958, biologists thought they had found the greenback cutthroat, assumed to be extinct, in the headwaters of the Big Thompson River of Colorado's Rocky Mountain National Park. The excitement faded when handwritten notes were found in National Park Service files relating to the planting of 270,000 "spotted native" trout in the stream by the Estes Park Sportsman Association. In 1967, the Wyoming Game and Fish Department likewise thought it had found the rare Green River cutthroat in a series of small lakes near Pinedale, Wyo. Two years later, notes were located at the local Forest Service office revealing the lakes had been stocked with Yellowstone in 1937 by the Civilian Conservation Corps.

Finding westslope streams was easy; finding populations that had survived uncontaminated by rainbow and Yellowstone genes was not. And since appearance is only skin deep as far as cutthroat and rainbow are concerned, biologists would have trouble identifying the fish they found on visual clues alone. In an informal test illustrating this problem, a DFWP biologist in northwestern Montana, Joe Huston, picked out 12 trout from Lake Koocanusa whose appearance threw doubts on their parentage. Sixteen fisheries biologists were asked to judge whether the trout were Yellowstone, westslope, rainbow, or a combination of two or all three. When the genetic results were back, the biologists had guessed right only 44% of the time. "No one got all 12 right, and no one got all 12 wrong," Huston noted.

It was obvious that accurate results could come only from a peek into the internal structure of the fish's cells. Fortunately, since the 1960s, biologists have had access to a method that can do just that. Called electrophoresis, the process plots the underlying pattern of the cell's genetic code by looking at selected proteins triggered by individual genes.

These tests are done for the DFWP at UM, using 25 to 30 trout from each creek. Tiny tissue samples are taken from the eyeballs, flesh, or livers, depending on the protein being measured. The samples are run through an ultrasonic grinder, where the cell walls are ruptured and the protoplasm freed. The internal proteins are soaked up with a wick, which is then placed in a special potato starch gel. A weak electric current is used to draw the proteins through the gel. After five hours, stains are applied and a distinctive striped pattern forms. By comparing it with standards taken from rainbow, westslope, and Yellowstone populations known to have survived unadulterated, this protein fingerprint can detect as little as 1% hybridization.

When results came back from the lab after the first season of the search, biologists had reason to be both encouraged and discouraged. A full dozen western Montana streams tested positive for pure-strain westslope. But an equal number, thought to be prime candidates for pure westslope populations, were tainted with rainbow or Yellowstone genes. The mixed results left the exact status of westslope cutthroat a larger question mark than before. So once the first order of business was out of the way—replenishing the westslope hatchery program with 3,000 pure-strain fish from 13 different streams in both 1984 and '85—the emphasis shifted into a major electrophoretic survey of the creeks along the South and North forks of the Flathead River.

Results from the expanded survey were better than the most optimistic biologist could have hoped. Unlike its beleaguered cutthroat cousins elsewhere in the Rockies, the westslope still dominated many of the drainages in its constricted territory. The reason simply seems to be eons of adaptation to mountain streams. In those creeks, the westslope apparently can easily out-survive and out-reproduce the Yellowstone. Only in lakes is it close to an even match.

An example of the westslope's natural dominance is Hay Creek on the North Fork of the Flathead River, said Huston. Between 1936 and 1953, 160,000 Yellowstone cutthroat were planted in the creek. "But it's still westslope right now," he pointed out. Other examples are many of the creeks along the east side of the South Fork of the Flathead, which shrugged off repeated plants of Yellowstone in the five years before Hungry Horse Dam was completed. Another is scenic Avalanche Lake in Glacier National Park, which was planted with a half-million Yellowstone over the years, yet stubbornly remains westslope territory.

There was a further discovery, said Huston. Streams with no lakes in their system have a reasonable chance of being pure-strain westslope, despite plants of Yellowstone. But for drainages with lakes stocked before 1970—before western Montana hatcheries converted to westslope—the odds are good that Yellowstone cutthroat have been able to survive in the lakes, creating hybrids that drift through the system.

"The next logical question is what do we do about it," Huston said. Eliminating the Yellowstone cutthroat from lakes would be an obvious solution. But few of these alpine lakes can be reached by road, adding the cost of a helicopter to the already considerable expense of poisoning lakes often over 100 feet deep. Trapping the spawning runs in the inlet streams is feasible, but would require years of repeat trips.

The genetic studies point to an easier solution—swamp them out by planting westslope on top of them. "We have a couple of places where we think that has happened already," Huston explained. An example, he said, is Red Meadow Lake in the North Fork of the Flathead River, which was planted 18 times with Yellowstone between 1932 and 1968. Then the department turned to westslope, and just three plants and 15 years later, the lake now tests out as 100% westslope.

Another example is Wildcat Lake in the Jewel Basin Hiking Area, atop the northern end of the Swan Range. After 47 years of Yellowstone cutthroat plantings, it is receiving regular stockings of westslope. As a result, just below the lake 80% of the trout

DAVE BOOKS

Biologists were elated to find that the westslope cutthroat still dominates many mountain streams, such as the South Fork of the Flathead (above) in the Bob Marshall Wilderness.

now test out as pure westslope. But eight miles downstream from the lake, the ratio is just the opposite—80% are still hybrids. "We think the westslope we've put in the lake are displacing the Yellowstone, and they're taking several years to work their way downstream," said Huston.

If the theory is correct, it means the department needs only to continue the planting policy adopted in 1970 when hatchery-bred westslope became available. The only addition will be periodic testing of the lakes to make sure the concept is working as predicted.

But the evidence indicates that the same tactics may work only with difficulty with the rainbow trout. "We'd have to dump in large numbers of fish annually for up to 20 years, with the idea of creating hybrids, but with the hybridization becoming less and less with passing years," said Huston. That's why more radical measures, such as poisoning, might be worth the expense with rainbow.

One possible target is the Graves Creek drainage, along the west side of Hungry Horse Reservoir. The creek contains a mixture of westslope, Yellowstone, and rainbow, and the usual hybridization of all three. But the bulk of the rainbow contamination can be traced upstream to the Jewel Basin lakes, four small alpine lakes that somehow, officially or unofficially, were planted with rainbow in the 1930s.

The lakes are attractive for several reasons. They are small enough, totaling 20 acres together and no deeper than 25 feet, to make poisoning practical. Their trout populations test out as pure rainbow, making them the only such lakes in the South Fork Basin outside the Bob Marshall Wilderness. And, importantly, they sit festering like bad apples in an area that is otherwise a historical haven for westslope. Removal of the rainbow would not have an immediate effect on fish in Graves Creek, warned Huston, but would only tip the scales in favor of westslope management. "We're talking a long time, because they're well entrenched," he pointed out. However, there are bigger stakes involved than just Graves Creek. Removing the rainbow would not only improve the creek's fishery, but would serve to protect the whole Hungry Horse Reservoir and South Fork drainage. "We'll go a long way toward stopping further contamination," said Huston.

The plan is to hit the lakes in a one-day operation right after Labor Day, when the summer hiking season ends. A helicopter will ferry in the boat, motor, chemical, and other gear—several thousand pounds in all. The fish toxicant would be rotenone, still the most environmentally safe in the fish management arsenal. Rather than directly poisoning the fish, it instead acts on the gills to cause death by suffocation. Within three to four weeks, depending on temperature, the rotenone breaks down and the lakes will be ready for replanting with westslope. By that time, the other gill breathers in the lake, such as zooplankton on which fish feed, will be returning to normal numbers.

A major roadblock may be convincing the public that poisoning four small lakes in the Jewel Basin Hiking Area, which has been proposed as wilderness, is a sound course of action. As a first step, the project was presented to representatives of Flathead area environmental and sportsman groups in February, and the reaction was generally favorable. The department has completed a Preliminary Environmental Review (PER), with the public to be involved in the final decision on the proposal.

Huston argues that removing nonnative fish fits directly into the Wilderness Act's goal of preserving native species. And, he points out, it should improve the fishing. Presently, it takes the rainbow six years to reach 12-inch size in the Jewel Basin lakes. "I expect a 12-inch westslope would be only 3 to 4 years old," said Huston.

The same kind of improved fishing can be expected in other mountain lakes and streams when the westslope is once again allowed to assert its natural dominance. "This is a major point in this hatchery program, that we know we can get a heck of a lot better survival," said Huston. "That's a bonus for fishermen, because they get more for their buck."

It also shows that a fish, which looked for a while as if it might join the grizzly bear as a threatened species, is nowhere as powerless as it once seemed. All it needed was a little help from its friends. ■

READERS RESPOND

In Defense of REAL Trout

I am writing this letter in defense of my friends, the trout. The slanderous piece of whitefish apologia—"It Don't Get No Respect," *Montana Outdoors,* March/April 1986—was an attack on the entire evolutionary history of the trout.

Drawing an association between the whitefish and the trout "...by the presence of a tiny adipose fin, located on the fish's back just forward of the tail fin" is nothing but an exercise in the most unscrupulous form of pseudobiology. Certainly, a more enlightened biology would include a taxonomy predicated on virtue and character, eschewing reliance on such insubstantial qualities as morphology. If then, virtue was employed as a marker, the trout and the whitefish would be distant cousins, if related at all.

Note, for example, the ratio of the whitefish to trout in most of our streams. It is clear, to me at least, that the whitefish is sexually promiscuous, reproducing with abandon and destroying the moral fiber of our streams. It is little wonder that trout inhabit different sections of a pool containing whitefish.

Table manners of whitefish reflect their low breeding. Lack of common sense brings them to the shallows to feed, slurping their food in lazy head-to-tail rises, with no awareness of cruising hawks and eagles. Seldom are there slashing rises designed to delight fishermen and capture even the most elusive insect. Only boorish shallow-water slurps with soft sucker mouths.

I resist discussing a whitefish on a fly. They have no character of their own. At first, when one is hooked, it mimics a real trout, pulling and shaking as it retreats to deeper water, exciting the fisherman who readies for creative use of currents and hoop-bending leaps. But no. Within seconds, the whitefish changes from trout to carp, allowing itself to be no more than winched to shore where it looks blankly ahead, giving foul kisses to the air.

I cannot imagine for a moment a whitefish on my dinner plate; the article was sufficiently tasteless in itself. I should think that Montana law would have in place restraints on bounders who publish such literature. Please cease and desist doing so, for the sake of the trout—the real ones.—*Dr. Edward H. Trontel; Kalispell, Mont.*

• *We won't try to defend the whitefish on the basis of its virtue, table manners, appearance, or leaping ability. But our panel of distinguished gourmands finds smoked whitefish superior to (perish the thought!) smoked trout. Let's hear from some defenders of whitefish out there. Friends Everlasting of the Whitefish (FEW)? Whitefish Unlimited?*—Ed.

How to Get Your Prints and Posters

I have a question regarding posters and prints of Joe Thornbrugh's winning painting, "Canadas Over the Pintlers." How does one obtain them?—*Leonard W. Huyser; Newport, Ore.*

• *Posters and prints are nationally marketed through Frontier Publishing, P.O. Box 1299; Jackson, WY 83001. Write to them for the name of a gallery in your area, or for a price list. They will be accepting orders for the signed and numbered prints until the end of August; only the number ordered will be printed, to protect the print's value to collectors.*—Ed.

Nostalgic Moment

I read with interest Jean Walker's article, "A Name for the Game," in your March/April 1986 issue. On page 33 of the article, reference is made to William Finlay of Great Falls, who was very important in trap and skeet shooting in Montana for many years.

My first job while growing up in Great Falls was as a trap boy at the trap and skeet range in Wadsworth Park during the late 40s. I can well remember Mr. Finlay's distinctive voice calling "Pull!" when his turn to shoot came up. He was also invariably one of the top shooters of the day.

I can remember also Mr. Finlay's visits to my Dad's gun shop which for many years was located in the basement of Murphy Maclay Hardware on Central Avenue.

It was a very nostalgic moment, while reading the article on Gertrude Hurlbutt, to come across a reference to William Finlay, a well-remembered character from my childhood.—*Harry M. Johnson; Kalispell, Mont.*

Woodsy Owl says
Stash Your Trash

Give a hoot.
Don't pollute.

Forest Service, U.S.D.A.

Photo Issue Provides A Great Afternoon

I'd like to subscribe to your magazine beginning with the Jan./Feb. 1986 issue. I just read a friend's copy, and the pictures are so beautiful.

From 1965-1975, I was employed as camp store manager at Two Medicine Campground on Two Medicine Lake. The centerfold picture of Lower Two Medicine and Rising Wolf Mountain was like seeing home sweet home. About 500 feet above the lake and about seven miles west of it is my camp store—at the foot of, but across the channel, Rising Wolf towering above us—with mountain goats near the top and black bears eating huckleberries. And the outlet of the lake winding around the foot of that great mountain, through Pray Lake, and down to drop over Ptarmigan Falls—we called it Two Medicine Falls then.

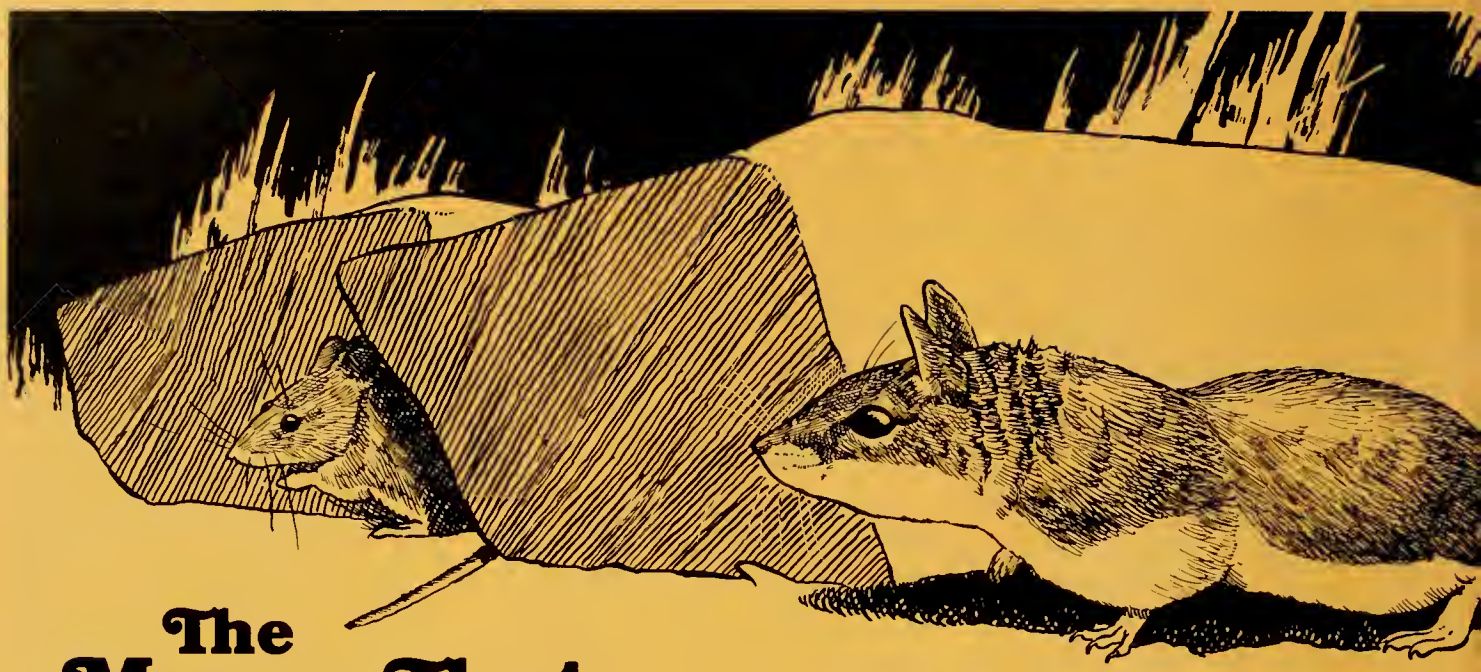
What a great afternoon I've had with this issue! And how close I've been to Montana's blue, blue sky and the Continental Divide.—*Mrs. Evelyn E. Lowry; Porter, Ind.*

Armchair Fisherman

I didn't receive my Jan./Feb. issue of *Montana Outdoors.*

I enjoy your magazine very much. When I miss an issue, it upsets my whole month, more so in the winter as I do most of my fishing at this time from an easy chair.—*M.G. Mertes; Gresham, Ore.*

• *We're happy to provide replacement copies, and yours is on its way.*—Ed.



The Mouse That Roars

by Craig J. Knowles
illustrated by Mark Wilson

"It's all your fault!" exclaimed my wife Pam as we bailed out of the old Dodge into the blackness of night. "I told you we should have gone around that mud puddle," she continued. Things had not gone well all day and we had not intended to be driving across the prairies of eastern Montana late at night. But the last of winter's snow had finally melted, and we were both anxious to set up our field camp and begin the second season of our field studies. Pam was studying bobcats, and I was working on prairie dogs. Even in the feeble light of a worthless flashlight, we could see we were up to our axles in some of Montana's worst gumbo. Then suddenly, not 10 feet away in the sagebrush, came the roar of the wild Onychomys. Our hearts leaped—not with fear, but with excitement, because we knew we had just heard one of nature's little marvels.

My first experience with the northern grasshopper mouse (*Onychomys leucogaster)* came in October 1976 when I was trapping mice on a coyote study for the Montana Department of Fish, Wildlife and Parks in the Miles City area. On the last day of field work, I captured three grasshopper mice in live traps and decided to take them home so I could observe them in captivity.

I built a cage worthy of the name "Mouse Hilton" and placed in it the three grasshopper mice, plus one deer mouse. The next day, I noticed the deer mouse hanging upside down from the top of the cage. Peculiar behavior, I thought, especially since it had many little cuts on its tail.

It wasn't until the next day when the deer mouse was again at the top of the cage with about an inch of its tail missing that I decided to spend some time watching to see what the problem was. When the deer mouse finally left the top of the cage to get its share of the food, it was immediately attacked by the grasshopper mice. Since it was faster and more agile than the grasshopper mice, the deer mouse escaped with a mighty leap to the top of the cage—but not without sustaining another bite to its tail.

After witnessing this, I let the deer mouse go, and decided I better do some reading on grasshopper mice to find out what kind of little beasts I was really keeping. I took the grasshopper mice to Dr. Robert Moore at Montana State University, Bozeman. He was able to tell me much about their life history. He identified two of the mice as males and the third as a female. In exchange for his help, I gave him one of the males and the female. Over the next three years, my little male Onychomys amazed me and many other people with his fascinating behavior.

Montana has 23 species of rats and mice. All but two of these, the house mouse and Norway rat, are native to the state. The native species can be placed into four broad taxonomic groups. The largest group includes the muskrat and voles. Voles are mouse-like mammals with large heads, small ears, short legs, and short, furred tails. The next largest group—in which the northern grasshopper mouse belongs—also includes the deer mouse and bushytail woodrat. The third group found in Montana is comprised of Ord's kangaroo rat and three species of pocket mice. These are highly specialized rodents adapted to living without water in dry climates; they are most abundant and diverse in the desert Southwest. The fourth broad family is Zapodidae, or jumping mice, of which Montana has two species.

Grasshopper mice are carnivorous—although they prefer insects, they've been reported to "stalk" and "bring down" deer mice and meadow voles.

These small rodents are no different than the larger game mammals: They, too, are found in specific areas and habitats. Like the mule deer which is found throughout the state in a variety of habitats, the deer mouse is widely distributed and rightfully deserves the title as the state's most abundant mammal.

In contrast, the water vole occurs only in the western mountains at higher elevations along fast-flowing streams, much like the mountain goat is found only in certain mountain habitats.

Few people are familiar with Montana's small rodents. One of the reasons might be because they are difficult to observe in the wild. Since they are small, they can easily hide in vegetation, or under rocks and logs. Furthermore, most species are nocturnal—they are active only at night when darkness provides additional protection from predators.

The northern grasshopper mouse is found throughout the Great Plains, from southern Canada into northern Mexico. It also occurs in most intermountain valleys and the Great Basin region. Two related species are found in the Southwest. The northern grasshopper mouse prefers dry, grassy habitats, with shrubs like big sagebrush. In other words, eastern Montana was made to order for the grasshopper mouse.

The grasshopper mouse is about five inches long and weighs from one to two ounces. It has a relatively short tail for a mouse, and has a stocky, teddy bear look. A person with little experience with small mammals could easily confuse it with a small hamster. Its short, dense fur is brown to grey on its back and sides, with white fur on belly and tail.

Grasshopper mice are active year-round, but confine their activity to night. During the day, they rest in shallow burrows which they make or have confiscated from other small mammals. I have even trapped grasshopper mice at entrances to prairie dog burrows.

Although they are capable of breeding year-round, in Montana they most likely do not breed during winter. In association with the female, the male grasshopper mouse digs a "U"-shaped burrow about one foot deep and two feet long that will serve as a nest. Gestation varies, according to the female's reproductive status. If it is her first litter of the year, gestation takes 26 to 37 days. However, gestation will last from 32 to 47 days if she has already had one litter. The usual litter has three to five young, but may have as many as seven. Young weigh about one-tenth of an ounce at birth, their eyes open at two weeks, and they are weaned about a week later. Sexual maturity is reached within two to five months.

It only took me two days (two days too long, as far as the deer mouse was concerned) to find out that my grasshopper mice were carnivorous. This behavior is not typical of most small rodents. Insects are the preferred food of the grasshopper mouse, as its name suggests. However, as I observed in my "Mouse Hilton," grasshopper mice enjoy juicy, red mouse-tail steaks if the opportunity arises. They have been reported to "stalk" and "bring down" deer mice and meadow voles in the wild. No easy feat, considering the athletic ability of deer mice, and the size (voles are nearly twice as large as grasshopper mice) and pugnacity of meadow voles. Grasshopper mice have also been reported to eat lizards and scorpions.

My Onychomys tamed down and made a fine little pet, learning to take food from my fingers. Not only did I learn that he was carnivorous, but I also found out how grasshopper mice make the spectacular kills that others have reported.

I always enjoyed catching the biggest grasshopper I could find in late summer and throwing it in with Onychomys. In an instant, he rushed the hopper, grasped it in his front paws, and, while orienting the hopper with the rear end against the floor of the cage, he delivered a fatal bite to the head. All this happened so fast the hopper didn't have time to even think about hopping.

The orientation of the prey apparently is very important in safely killing it. Many beetles which grasshopper mice eat are capable of ejecting a fine spray of repulsive fluids from their rear ends, a defensive action much like skunks. Unless properly oriented, grasshopper mice would get the irritants sprayed right at their eyes and mouth. People in southern portions of the grasshopper mouse's range release grasshopper mice in their homes to control cockroaches. When mice are the prey, the grasshopper mouse will pounce on the unfortunate mouse's back and deliver a quick bite to the base of the skull, killing the victim within 10 seconds. My Onychomys' favorite eating adventure turned out to be cleaning meat off bones (not much different than a dog). I think chicken was his favorite food.

Not unexpectedly, the male grasshopper mouse is territorial like its larger counterparts—wolves, tigers, and other large carnivores. Although males vigorously defend their territory against other males, they share their territory with several females. Densities of grasshopper mice in Montana's prairies probably do not exceed one per acre. In contrast, deer mice in the same habitat will frequently reach densities of over 10 mice per acre. For mice, grasshopper mice have unusually large home ranges; males typically cover five to seven acres, while females range over one to two acres. A deer mouse in similar habitat might range over one acre, and a meadow vole only one-fourth of an acre.

Being territorial and covering relatively large areas requires special behaviors to mark and hold territories. Male grasshopper mice deposit feces in shallow pits at regular locations as scent piles, much like bobcats and many other territorial mammals. They add extra odor to these feces with special glands located in the anal region. These glands also

allow male grasshopper mice to quickly mark territory boundaries as they make their nightly rounds by simply pausing, digging a shallow depression, and dragging their anal region over the soil.

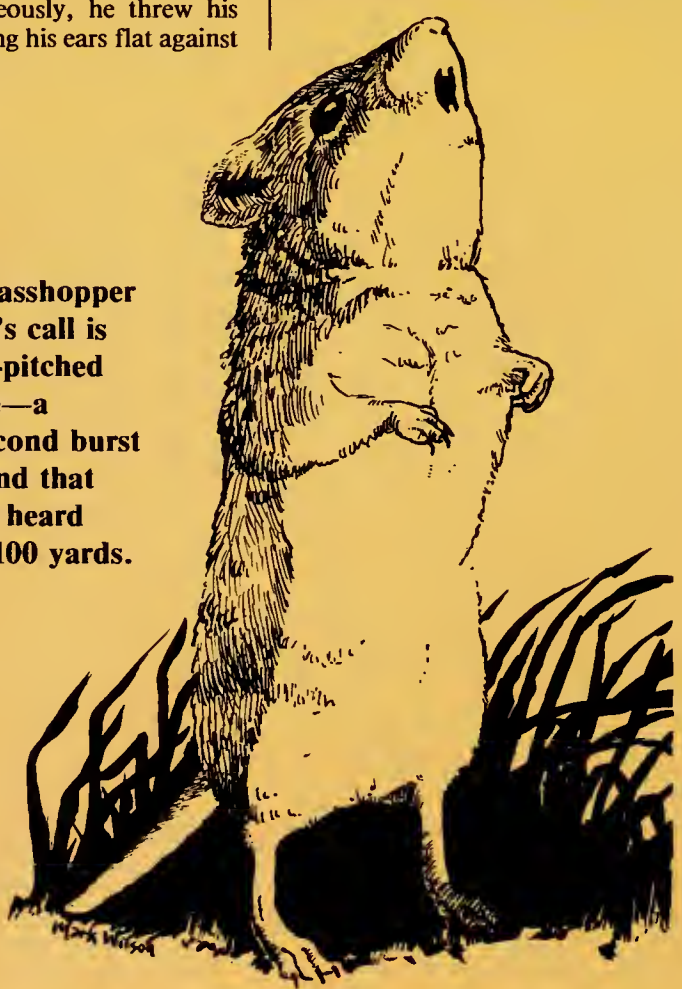
All mice can squeak, but only the mighty Onychomys roars. The call of the grasshopper mouse is unique among small rodents. Again, it is associated with territorial behavior. The call is a one-second burst of sound that can be heard for up to 100 yards. To the human ear, it sounds like a high-pitched whistle. Usually, only the male grasshopper mouse calls. He announces to other mice the location of the caller, his age, size, and sex. Studies have shown that larger and older grasshopper mice have a deeper call than younger or smaller mice.

My Onychomys called predictably every night, within minutes of when I turned out the lights. Using subdued lighting, I observed his calling behavior. He emerged from his nest, ran to a corner of the cage, and stood on his hind feet, using his tail as a brace. Simultaneously, he threw his head back, forcing his ears flat against his body and opening his mouth wide to emit his call. This posture sparked visions of a miniature wolf howling. After polishing off his evening meal, he entered his exercise wheel and ran all night, pausing only infrequently to call, mark a corner of the cage, or snack on a bone. Before retiring to his nest in the morning, he usually gave one final call. Undoubtedly, this must be the behavior of wild, adult male grasshopper mice defending their territories.

While many details of its life history behavior still are unknown, the grasshopper mouse is unique among small rodents. It adds a bit of color to this often forgotten segment of Montana's wildlife. It is exciting to think that in the world of mice and rats on the eastern Montana prairies roams one of nature's great predators.

I like to think of the grasshopper mouse with its bobbed tail and long incisor as the reincarnation of the saber-toothed tiger, pouncing on the backs of woolly mammoths.

Since hearing the grasshopper mouse call that April night in 1979, I have heard it call twice more in the wild (once while I was changing a flat tire). Who knows, perhaps the next time you happen to be in the sagebrush prairies of eastern Montana at night, maybe you, too, will hear the roar of the wild Onychomys. ■



The grasshopper mouse's call is a high-pitched whistle—a one-second burst of sound that can be heard up to 100 yards.

BOOK REVIEWS

THE GRIZZLY IN THE SOUTHWEST, by David E. Brown, University of Oklahoma Press, 1005 Asp Ave., Norman, OK 73019; 1985, 280 pages, $19.95 hard cover.

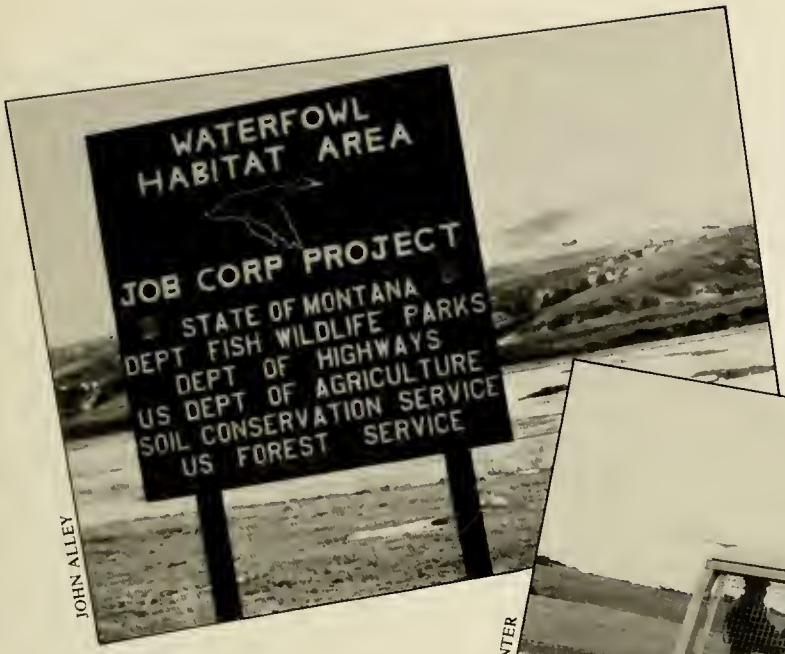
This excellent historical account of the grizzly's disappearance from Arizona, New Mexico, southern Colorado, and northern Mexico should be of special interest to those who are working to ensure that Montana's grizzlies don't meet a similar fate. As author David Brown says in his preface, "What is presented here is a historical study with a wildlife-management lesson....it is only through the retelling of our past that we understand our present attitudes and actions. These will determine the great bear's future in the north, just as our past attitudes have extirpated him from the south."

As Brown points out, "The death knell for the grizzly in the Southwest was tolled not by a church bell but by a train whistle." The transcontinental railroad opened the region to extensive cattle ranching in the late 1800s. Widespread overgrazing of the range, followed by torrential floods, initiated a cycle of erosion that destroyed much of the region's vital grizzly habitat. This, coupled with an ever-increasing influx of settlers and a government-sanctioned program of bear persecution, resulted in the rapid decline and eventual extinction of the grizzly from most of the Southwest by about 1930.

Although it is a sad story, "The Grizzly in the Southwest" avoids the hand-wringing that characterizes many accounts of a species' decline. Brown, who is game branch supervisor for the Arizona Game and Fish Department, sticks to the facts and tells the story in a lively and readable style. The historical photos that supplement the text are especially interesting.

While his sympathy clearly lies with the grizzly, Brown resists making moral judgments about the people and events of the late 1800s and early 1900s that brought an end to "Old Ephraim's" colorful existence in the Southwest. He reflects wistfully on the possibility of reintroducing the grizzly to the wilderness of Arizona and New Mexico, but concludes, with a sigh of resignation, "Perhaps another generation will bring him back. I doubt whether mine will." —*Dave Books*

DOZERS FOR DUCKS



JOHN ALLEY

ANACONDA JOB CORPS CENTER

The Warm Springs Wildlife Management Area turned out to be a perfect training ground for the Anaconda Job Corps Heavy Equipment Program.

by John Alley and Ron Hanson

What do you do with 10,000 acres of swamp, potholes, and gravel scrubland? If you are a state wildlife agency, you manage it as potential wildlife and waterfowl habitat. If you are a local manager for that agency, and you have a vision, you expand the potential and make it a reality. Bob Greene was that kind of manager. His agency was the Montana Department of Fish, Wildlife and Parks (DFWP), and the area of his concern was the Warm Springs Wildlife Management Area.

Bob's dream eventually involved, in addition to his own agency, the Anaconda Minerals Company, the Montana Department of Highways, the Montana Department of State Lands, the Deer Lodge office of the Soil Conservation Service, the Deerlodge National Forest, and the Anaconda Job Corps Center.

The Warm Springs Wildlife Management Area (WMA) lies in the Deer Lodge Valley near the town of Warm Springs. The lands are owned by the Anaconda Minerals Company, the Montana Department of Institutions, the Montana Dapartment of Highways, and the DFWP, which has managed the site for more than 20 years. Located midway between Freezout Lake WMA to the north and Red Rock Lakes National Wildlife Refuge to the south, the area skirts the eastern edge of the Pacific Flyway. It consists of a series of settling ponds intermingled with marshes and drier upland sites. The settling ponds were built by the Anaconda Minerals Company in 1954 to receive the effluent from the underground copper mines at Butte, 20 miles to the east. The ponds, which no longer receive effluent from the mines, have become suitable as nesting

"The accomplishments at Warm Springs are a monument to the hard work, dedication, and public spirit of the Anaconda Job Corps."

—Frank E. Salomonsen, forest supervisor,
Deerlodge National Forest

sites for migratory waterfowl. Silver Bow Creek meanders through thickets of willow and joins Warm Springs Creek nearby, forming the Clark Fork River.

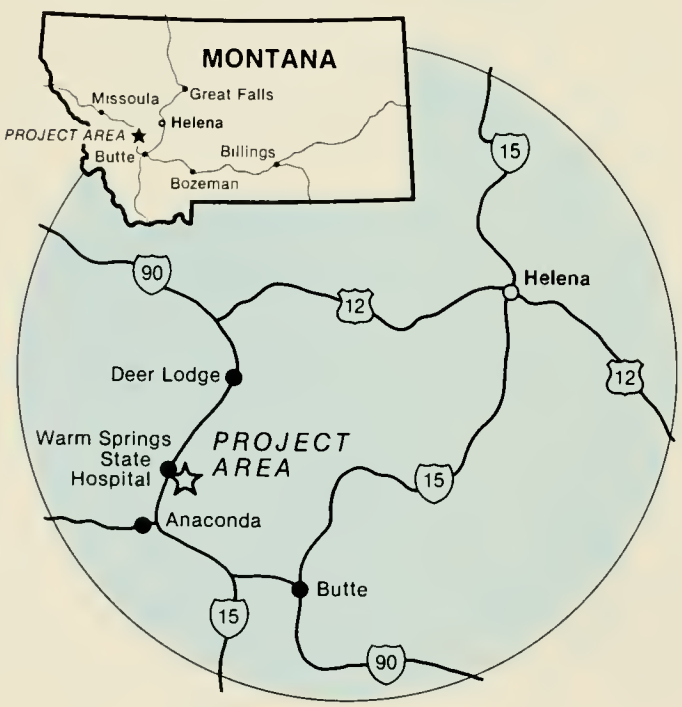
In 1980, a major pilot project was undertaken at Warm Springs State Hospital to develop geothermal heating for hospital buildings. To cool the warm water from the project, several lagoons were built with the assistance of the Anaconda Job Corps and its heavy equipment program. After the ponds were in use, it became apparent to Greene they would be ideal for waterfowl habitat. He reasoned this concept could be applied on a much larger scale. To accomplish this, he turned to the Anaconda Job Corps for help.

The Anaconda Job Corps Center, on national forest land 10 miles west of Anaconda, operates as a unit of the Deerlodge National Forest. The center functions as a training facility for young people whose opportunities are severely limited. Students at the center receive the equivalent of a high school education, developing skills in one of several trades. More than 7,500 corpsmembers have been trained at the center since it began operation in 1966.

The Anaconda facility has a capacity of 224 trainees. Seventy-one full-time employees operate the center, including five trade union contract instructors. The International Union of Operating Engineers sponsors the Heavy Equipment Operation Training Program. Corpsmembers receive on-the-job experience with legitimate projects for the Forest Service, local communities, and for the center itself. By graduation, trainees have at least 1,000 hours of hands-on training in equipment operation. Normally they are then placed in a Union Apprenticeship Program.

The ideal habitat envisioned by Greene called for a succession of shallow ponds to be contained within a network of more than 20 miles of dikes. In addition, there would be nesting islands built within each pond. It looked like a perfect training ground for the Job Corps Heavy Equipment Operation Training Program, and they tackled the project eagerly, beginning in the winter of 1982.

Lesser scaup



Bob's vision began to take shape. The dikes were made wide enough to serve as roads for public and administrative access. An additional 12 miles of road were constructed in the vicinity. Two campgrounds and a boat ramp also became part of the plan. A general cleanup of old dump sites was accomplished as well.

To date, 60% of the anticipated work has been completed. Over the past three years, the Job Corps crews (normally eight to 10 corpsmembers) have devoted 150 days to the project, primarily during the winter. More than 525,000 cubic yards of material will have been moved by the end of the job, enough to cover a football field to a depth of 100 feet! Estimated value of the finished project is $700,000.

Much work remains. But with the impetus provided by the Job Corps, momentum has begun to build. Ducks Unlimited has recognized the importance of the area, and has pledged funds to help complete the project. The Anaconda Minerals Company has been extremely cooperative from the beginning. The Pintler Chapter of the Audubon Society has also become involved, and volunteers have erected a nesting platform which has already attracted a pair of ospreys.

As the work goes on, the DFWP hopes to broaden the

MIKE ADERHOLD

"The Warm Springs Project is one of the most important going on in the state. It is particularly meaningful that so many agencies and groups are working together to accomplish something so complex. I make note of the fact that the most critical involvement has been that of the Anaconda Job Corps."

—Jim Flynn, director, Montana Department of Fish, Wildlife and Parks

JOHN ALLEY

Bob Greene

area's appeal to include related recreational needs, such as fishing, bird-watching, and a special trail for people with handicaps.

The Warm Springs WMA is classified as a "wetland." Wetlands have too often been viewed as wastelands, and thought to be useful only after being filled, drained, or otherwise "reclaimed." Nothing could be further from the truth. Such lands provide immense benefits, including water quality maintenance, fish and wildlife habitat, flood and erosion control, groundwater recharge, livestock and wildlife grazing, and fishing and hunting opportunities.

Because the importance of wetlands has been poorly understood, millions of acres have been lost to short-term "improvements" for agriculture and urban development. In fact, since the first colonial settlement in the United States, we have lost over half of our historic 215 million acres of wetlands. This loss has devastating economic, environmental, and social implications for the entire country.

In view of the wholesale disappearance of wetlands, the 10,000 acres being preserved at Warm Springs may seem like a drop in the bucket. But it is a step in the right direction. In 1984-85, the resident goose and duck population of the area was estimated at 15,000. In the past several years, the local breeding population of Canada geese has grown to 200. Bob Greene believes the area has a greater potential for duck productivity than Freezout Lake WMA, one of Montana's premier wetlands (see *Montana Outdoors,* Sept./Oct. 1983).

In 1984, Freezout Lake actually "froze out" early, along with other reservoirs east of the Continental Divide. This sent large numbers of migratory waterfowl winging south in search of open water. They found Warm Springs WMA, and enjoyed Montana's hospitality for another month. Nearly 100,000 snow geese visited Warm Springs that year.

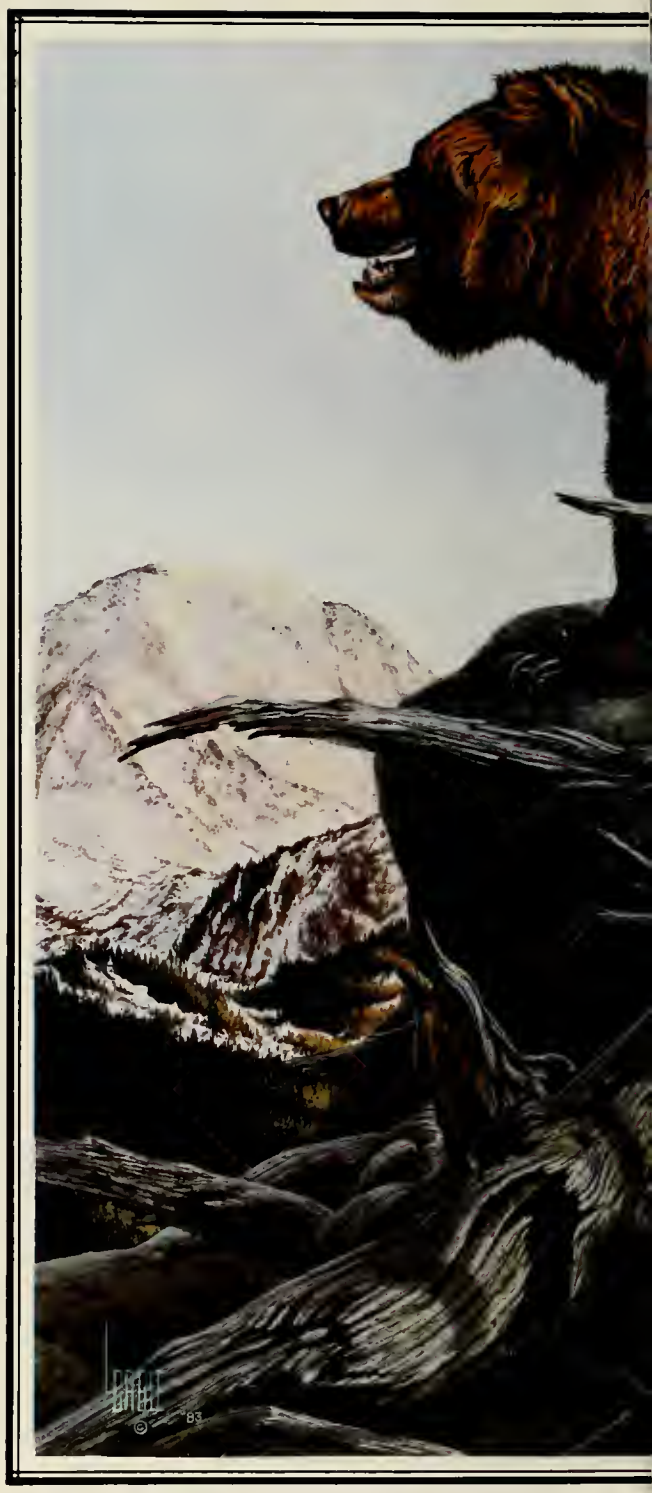
Populations of other wildlife species have also been growing. Mink, muskrat, beaver, coyote, and fox are commonly seen, and white-tailed deer are thriving in the willow bottoms, along with an occasional moose. Of the 381 bird species recognized in Montana, 218 have been sighted on the project. The ponds have been stocked with trout, and could soon become an important aspect of the Clark Fork system's fishery.

When it is finished, Warm Springs will certainly be one of the gems of the state's wildlife management area system. Dedication of the project is scheduled for September of this year. Sufficient work will have been done by then to give a clear picture of what Bob Greene has been dreaming about all this time. Bob retired from the DFWP last summer after 38 years of service, but you can bet he'll be there. ■

MANAGING THE GRIZZLY BEAR

by Robert D. Brannon,
Richard David Mace,
and Arnold Dood
illustrated by Lee Cable

A recently completed environmental impact statement offers some new ideas for balancing grizzly bear conservation with human needs in the northern Rockies.



"Permanent grizzly ranges and permanent wilderness areas are, of course, two names for one problem," says Aldo Leopold in his conservation classic, "A Sand County Almanac." "Enthusiasm about either requires a long view of conservation, and a historical perspective. Only those able to see the pageant of evolution can be expected to value its theater, the wilderness, or its outstanding achievement, the grizzly."

The early history of the grizzly bear in Montana parallels that of other western states. Along with the elk, wolf, and bison, it disappeared from the plains as the rising tide of settlement and population growth pushed westward. The western mountains provided security for grizzly populations for a time, but in most states the great bears were relentlessly shot, trapped, and poisoned into oblivion. The grizzly disappeared from Texas in 1890, California in 1922, Utah in 1923, Oregon and New Mexico in 1931, and Arizona in 1935.

In Montana, the grizzly had two things working in its favor: large expanses of wild, rugged terrain, and a populace that was beginning to see, even in the early 1900s, that its wildlife heritage was worth preserving. Beginning in 1923, when the Montana Fish and Game Commission declared the grizzly bear a game animal so that hunting could be regulated, and continuing up through the present, Montanans have supported a series of management actions taken to ensure survival of the grizzly.

In 1940, when Montana's first professional big game biologist was hired, one of his first assignments was to prepare a status report on the grizzly. The years that followed saw a number of restrictions on grizzly hunting: the end of spring hunting, protection of cubs and female bears with cubs, and a ban on the use of bait. In 1974, Montana's portion of the Yellowstone Ecosystem in south central Montana was closed to grizzly hunting, as was the Cabinet-Yaak Ecosystem in extreme northwestern Montana (see map). This left only the Northern Continental Divide Ecosystem open to limited grizzly bear hunting.

In 1975, the Department of Fish and Game (now Department of Fish, Wildlife and Parks—DFWP) prepared its first environmental impact statement on grizzly bear management. In response to the grizzly's listing as a "threatened species" in the lower 48 states under the Endangered Species Act, the DFWP negotiated with the U.S. Fish and Wildlife Service to establish an annual quota of 25 man-caused grizzly bear mortalities (from hunting, control actions, accidents, etc.) in northwestern Montana.

In 1983, this quota was further restricted by limiting the annual man-caused mortality of female grizzlies to nine.

In 1984, continued concern over grizzly bear hunting seasons, increasing depredation problems, and the availability of new grizzly population data prompted the DFWP to begin preparation of a second environmental impact statement (EIS) on grizzly bear management in northwestern Montana. This document, completed a few months ago, reviews data pertinent to grizzly bears and their management, presents management alternatives, makes recommendations to other agencies on grizzly bear policies, and prescribes a course of future management.

The management plan outlined in the EIS addresses only the two grizzly bear ecosystems in northwestern Montana—the Cabinet-Yaak and the Northern Continental Divide. The stated goal for the former is to maintain an average density of one bear per 30 to 40 square miles, or approximately 90 to 125 bears. The goal for the latter (exclusive of Glacier National Park, for which the DFWP has no management jurisdiction) is an average density of one bear per 15 to 30 square miles, or 280 to 540 bears. Grizzly bear densities for populations elsewhere in North America

range from one bear per six square miles in excellent habitat to one bear per 58 square miles in marginal habitat. The density goal for the Cabinet-Yaak is much lower than for the Northern Continental Divide because human impacts on grizzly habitat have reduced the former's ability to support grizzly bears.

Currently the number of grizzly bears in the Cabinet-Yaak Ecosystem is considered well below the density goal prescribed in the EIS. However, the Northern Continental Divide population, not including Glacier Park, is now estimated at 356 to 549 animals—at or above the density goal in the EIS. If Glacier Park is included, the population estimate is 549 to 813 bears. The latter estimates are based on the results of five research efforts in or adjacent to the area and the judgment of biologists who have worked there.

In addition to population density, reproductive capability also influences the long-term health of a grizzly bear population. Litter size, litter frequency, and age at first litter for Northern Continental Divide grizzlies compare favorably with those for other North American grizzly populations:

	Northern Continental Divide	Other North American populations
Litter size	2-2.5	1.5-2.5
Litter frequency	every 3 yrs.	2-4 yrs.
Age at first litter	about 5 yrs.	4-10 yrs.

Since 1975, when the annual quota on man-caused grizzly deaths was implemented, an average of 18 grizzly bears have been killed each year in the Northern Continental Divide Ecosystem. Records show that in a typical year four of these bears have been killed in control actions after causing depredation problems; two have been killed illegally; one has been killed by a vehicle or train; one has been killed by a hunter mistaking it for a black bear; and the remaining 10 have been legally harvested by grizzly hunters.

Although grizzly mortalities due to mistaken identity receive more public attention than any others, it is among the least significant sources of mortality. Nonetheless, the DFWP has undertaken a public information program to reduce these mortalities.

Grizzly mortality due to control actions is an inevitable part of management. Grizzlies that damage property or pose a threat to human life must be removed, preferably through relocation. If actions taken to prevent grizzlies from causing further depredation are unsuccessful, repeat offenders must be destroyed. In recent years, depredation problems along the Rocky Mountain East Front have intensified, requiring an increased number of control actions. Most of these have involved transplanting bears to other areas.

There is no indication that hunting has adversely affected the grizzly bear population in the Northern Continental Divide Ecosystem. On the contrary, it appears that limited, regulated hunting helps maintain a healthy equilibrium between bears and man by keeping bears more wary and less likely to create problems that necessitate control actions. Bears that become bold and aggressive through frequent contact with humans are the ones most likely to be removed from the population. If hunting favors those grizzlies which avoid humans, in the long run it contributes to the bear's survival as a species.

Limiting or banning the hunting of grizzly bears in Arizona, Colorado, Idaho, and Washington in 1929, 1954, 1946, and 1969, respectively, did not stop grizzly bear mortality, nor did it stop their extermination in Arizona and Colorado and near-extermination in Idaho and Washington. In southern Alberta, where hunting of grizzlies was stopped in 1970, bear numbers increased, but so did the number of illegal kills. Since 1982, when the hunting season there was reopened, the grizzly population has remained stable or has increased, while the number of illegal kills has declined.

Based on a review of available population and mortality data on bears from Montana and other parts of North America, and an assessment of past and present management needs, the EIS proposes a "preferred alternative" for grizzly bear management in northwestern Montana. This alternative includes several recommendations in addition to the population goals discussed earlier, including the following new or modified grizzly bear hunting regulations: (1) restricting hunters to one grizzly bear in their lifetime; (2) prohibiting the taking of young bears and females with young (young are defined as 2-year-olds or younger); (3) adjusting annually, if necessary, the total or female mortality quota; and (4) requesting that hunters not shoot any bear in a group. These new regulations, designed to make hunters more selective, should reduce both total and female bear mortality. In fact, in 1985 regulations (2) and (4) were implemented, and hunter harvest was only six bears, all males, compared with an average of 10 (including four females) over the previous 10 years.

Other recommendations contained in the EIS include the following: (1) Reducing the man-caused mortality quota in the Northern Continental Divide Ecosystem to 21 bears, with a female subquota of six. (2) Controlling depredating grizzlies by a variety of means, including limited damage

continued on page 12

CONTRIBUTORS

• Not too long ago, the chance of seeing a bald eagle during a summer outing in Montana was rare. Certainly, Montanans could see bald eagles during spring and fall migration and in the winter. But now, Montana hosts an expanding breeding population of this remarkable national symbol. Turn to page 2 for **Dennis Flath's** and **Rob Hazlewood's** story of "Montana's Soaring Eagles—Up, Up, and Away." Flath is the department's nongame biologist; Hazlewood is a wildlife biologist for the Endangered Species Office, U.S. Fish and Wildlife Service.

• **Beth R. Riggs** was the "leader of the pack" and she was demonstrating some "Good Times in the Badlands." The children learned about pinnacles, fluted ridges, and the ongoing erosion that shapes Makoshika State Park; about fossils and an assortment of very-much-alive creatures that now inhabit the place; about the origin of the park's name—from the Sioux words "maco sica," meaning "badlands." Join Riggs' tour by turning to her article on page 6. She is a park operation specialist with DFWP in Miles City and previously served as a tour guide at Lewis and Clark Caverns.

• When's the last time you read something about Missouri or Missourians without the story making a big point about the necessity of "showing" the folks from Missouri something? "Missourians on the Madison" is no exception. The two Missouri fishermen were "showed" the Madison River—and it both showed 'em and wowed 'em. Turn to page 15 for **Spencer E. Turner's** article. Turner is a trout biologist for the Missouri Department of Conservation. For the past 17 years, he's worked on developing Missouri's trout management program.

• The inside front cover illustration by Helena artist **Shirley Cleary** shows Missourians and Montanans alike that the Madison is a paradise for fishermen. Last winter Cleary participated in a Women in Wildlife Show, an invitational exhibit sponsored by Wild Wings Gallery in Minnesota. This summer she will be featured in *The Artists* magazine; she has prepared a "how to" feature about her work.

• In the early 1800s, the westslope cutthroat trout reigned unchallenged in the Montana Rockies. As **Rick Hull** writes, "It was the dominant fish...in an estimated 16,000 miles of streams and rivers on both sides of the Continental Divide...." Hull notes the years since have been "desperate ones" for the former king. But locked in its genes is a secret strength that has helped convince biologists the westslope can once again become the major game fish in an important part of its historical range. Hull is a reporter and photographer for the Daily Inter Lake in Kalispell, and his beat includes fish and wildlife subjects. He wishes to acknowledge the assistance of Joe Huston, DFWP biologist in Kalispell, on "The King Returns." It begins on page 19.

• All mice can squeak. But the northern grasshopper mouse is "The Mouse That Roars." The call is unique among rodents, and it is a one-second burst that sounds like a high-pitched whistle to human ears. To learn more about one of nature's little marvels, turn to **Craig J. Knowles'** article on page 24. Knowles is a wildlife biologist with FaunaWest Wildlife Consultants in Columbus.

• Illustration of the mouse that roars is from free-lance illustrator and photographer **Mark Wilson** of Missoula. He has been a ranger and research assistant in Yellowstone National Park, and has done illustration for the Sierra Club, National Park Service, the Great Bear Foundation, and others. He says: "My feelings for wildlife and the natural world, and a desire to work for its benefit as well as mine, fit perfectly with my interests in illustration and photography."

• **John Alley** and **Ron Hanson** open their article with a question: "What do you do with 10,000 acres of swamp, potholes, and gravel scrubland?" If you are a wildlife manager with a vision (such as Bob Greene), working for a state agency (such as the Department of Fish, Wildlife and Parks), you enlist the help of some other like-minded agencies and figure out an answer that will have positive effects for years to come: "Dozers for Ducks." Dedication of the "answer" and tribute to some of the participants (especially the Anaconda Job Corps Center) is set for September. Alley is a visual information specialist and Hanson a multiple use coordinator, both for the Deerlodge National Forest. Their article begins on page 27.

• Because of continued concern over grizzly bear hunting seasons, increasing depredation problems, and new information on grizzly populations, the DFWP in 1984 prepared a second environmental impact statement (EIS) on grizzly bear management in northwestern Montana. **Robert D. Brannon, Richard David Mace,** and **Arnold Dood** underscore and explain some of the document's recommendations in their article, "Managing the Grizzly Bear," beginning on page 30. Brannon is a DFWP biologist in Bozeman; Mace is a DFWP biologist in Kalispell; and Dood is the department's endangered species biologist. The principal authors of the grizzly bear EIS, the three were recognized at the March meeting of the Montana Fish and Game Commission for their contributions to the EIS and to the long-term survival of the grizzly bear.

• *MO* is pleased to welcome the work of wildlife painter **Lee Cable** of Tampa, Fla. His work is widely known and exhibited, including at the prestigious Leigh Yawkey Woodson Bird Art Exhibit. He won the Florida Duck Stamp competition for 1982-83, and just completed 40 original paintings for the permanent collection of a Florida bank. He claims "all wildlife" as his subject, and notes his love for the natural world began with his father as teacher on their Ohio farm. He says: "I always strive to instill the spirit of life in my subjects, so that the viewer is captured." His grizzly bear painting is both lifelike and captivating.

• **John Allen** and his friends set off on a perfect afternoon hike: sunny, Glacier National Park, wildflowers. Enter two straw-brown grizzly bear cubs. And not far away, their mother. Wind, grass, humans, bears, even clouds seemed suspended. Turn to page 34, for our continuing series, "Perspectives," to find out what happens. There's a clue in the title: "Up and Over the Hill." Allen is a tour bus driver in Denali National Park, Alaska, and has done similar service at Glacier, Glacier Bay, and Grand Canyon National parks.

• Illustration for Allen's article is by **Diane Nugent,** Butte. Nugent does pastel portraits and commissioned pen and inks and watercolors of homes and businesses from her studio at 1560 W. Granite; Butte, MT 59701.

• "7 and 8 Add Up to Diversity" to a small, but loyal, group of north central Montana sportsmen. As **Harvey Nyberg** explains, the numbers refer to two small wildlife management areas in Phillips County. Area 7 is known for its pheasants, white-tailed deer, and valuable nesting habitat for both ducks and geese. Area 8's prominent feature is a 470-acre marsh—a living tribute to the power of positive thinking. Turn to page 36 for a glimpse of these little known department lands. Nyberg is a Malta-based department wildlife biologist.

• Special thanks to the following photographers for their contributions to this issue: **Sharon L. Dupuis,** Malta; **Lee Graves,** Hardin; **Steve Wirt,** Whitefish; and to the following photographers who work for the department: **Mike Aderhold, Kristi Dubois, Wade Fredenberg, Louis M. Kis,** and **Bill Thomas.**

Up and Over The Hill

by John Allen
illustrated by Diane Nugent

It was a perfect day for a hike. The plan was to spend the afternoon going up a short trail to an abandoned fire lookout. The sunny, spring day promised clear views from the trail's end atop Glacier National Park's Elk Mountain.

We asked Ernie to lead the group. He had almost no experience, while the other three of us had spent many a mile on the trails in Glacier and also in many wilderness areas. The logic of having a rookie lead is simple: He sets the pace so the rest of the group isn't constantly walking away from him.

The hike was going well. Having only day packs, no one grew tired. We joked, talked, sang. Often we stopped to admire the views. As we cleared timberline and began to enter the alpine meadow area, I was engaged in just such a view-gazing/rest stop. I heard Ernie call from up ahead. He was staring up the slope to our right. He looked at me and, in the same tone in which you'd discuss the weather, said, "John, I think there's something up there."

My view was screened by a few low evergreens. I stepped forward, expecting to see perhaps a magpie, a marmot, a deer. I glanced up directly into the eyes of a grizzly cub not 30 feet away. A soft toss with a ping-pong ball would have bounced off his furry forehead. He was not big, obviously born that winter. He had seen us and was standing in the wildflowers staring. Head cocked, ears up, he looked like a friendly teddy bear. Another straw-brown cub romped in the grass, oblivious to our presence.

Instantly I motioned the guys behind to stop. I thought, "My God, where's the mother?" About that time, what I had taken to be a large greyish outcrop of rock in the middle of the meadow...moved! Not more than 10 feet past the cubs, literally a stone's throw away, the sow rose to her feet. An entire boulder turned into bear.

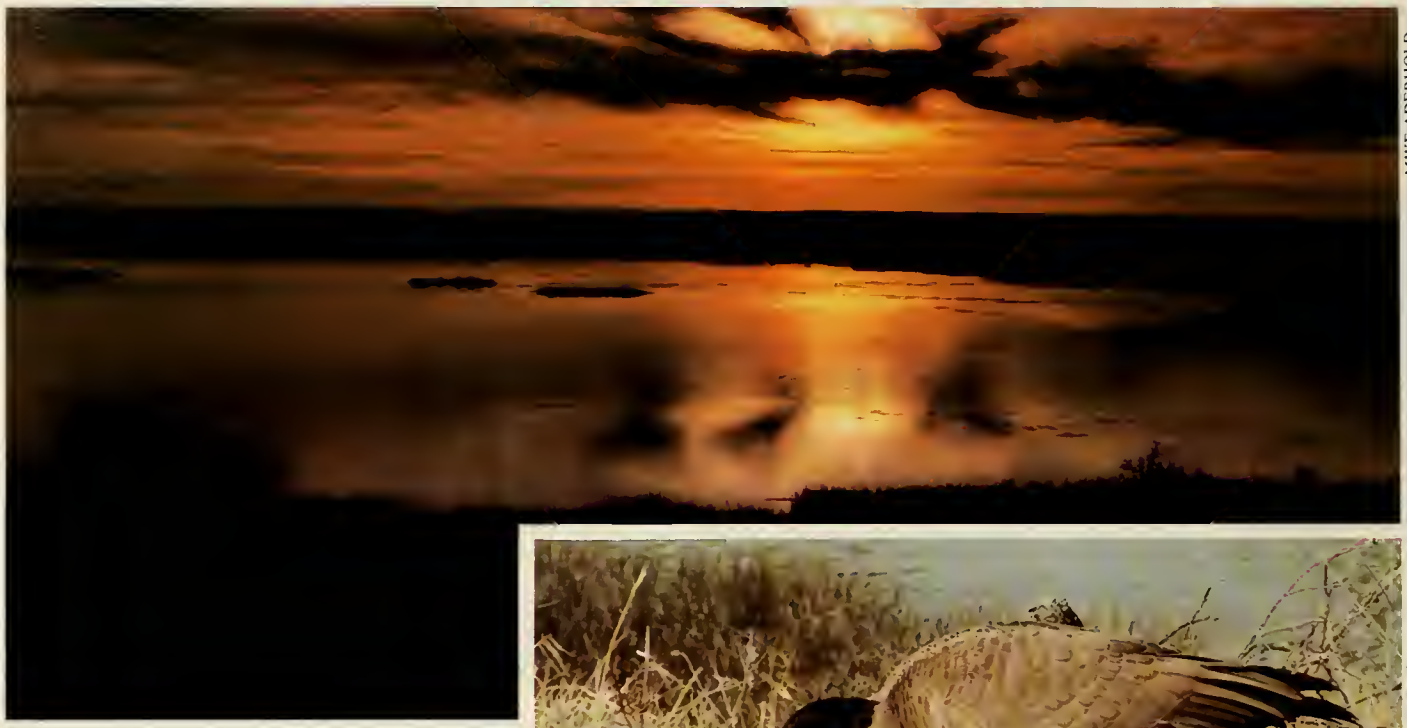
One glance from the sow turned us into four human columns of stone. There were no substantial trees, no place to run. She let out a "woof" that came from deep inside an animal human beings are simply not in the same league with. At that, everything froze. Wind, grass, humans, bears—even the clouds hung suspended.

The string snapped. Wheeling, she swatted one of the cubs about 10 feet uphill. In one jump, mother and cubs were at full speed. Clods of dirt and grass flew as, flanked by her cubs, she charged up the hillside. Then everything was in motion. Trees swayed. Puffy white clouds raced through blue sky; green grass waved.

In the middle of it all...the bears. Pristine power in action. No man-made machine ever moved with such grace and strength. Forepaws pulling the entire earth to driving pistons of rear legs. Afternoon sunlight highlighting enormous muscles rippling straw-brown power. The three flowed up and over the hill. Pure, raw beauty etched into my mind. Then they were gone.■.

Diane Nugent © 1986

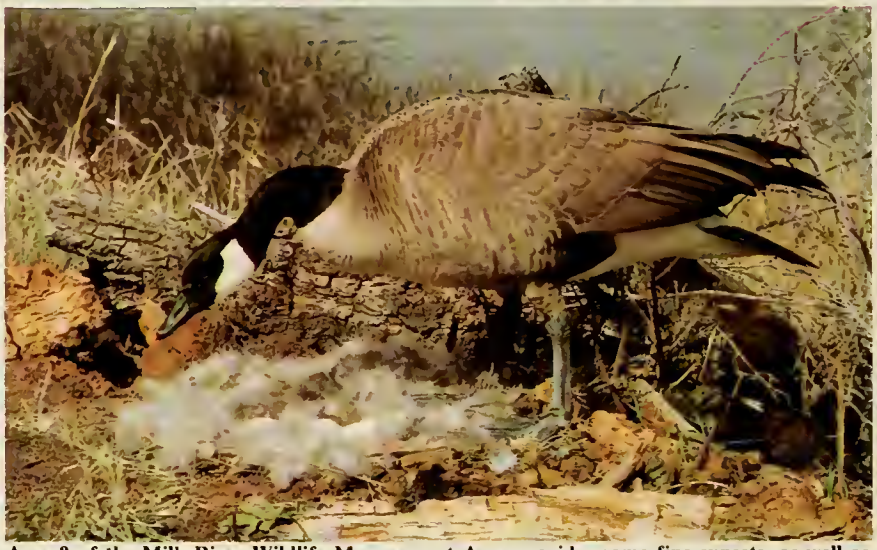
DEPARTMENT LANDS:



MIKE ADERHOLD

7 and 8 Add Up To Diversity

by Harvey Nyberg



STEVE WIRT

Area 8 of the Milk River Wildlife Management Area provides some fine sunsets, as well as secure nesting habitat for a thriving population of Canada geese.

Sun River. Blackleaf. Beartooth. Blackfoot-Clearwater. Montana is blessed with a rich heritage of wildlife management areas and, because of their importance to big game populations, their names are well-known to countless sportsmen.

To a small but loyal group of mostly north central Montana sportsmen, the numbers 7 and 8 have uncommon significance. Those numbers refer to two small wildlife management areas in Phillips County, 21 miles northeast of Malta. They are known not only as areas 7 and 8, but also as the Milk River or Sleeping Buffalo Wildlife Management areas (WMAs). (Sleeping Buffalo is actually part of the larger Milk River area.)

Why they are known as Areas 7 and 8 is fairly recent history. During construction of the Milk River Irrigation Project, the U.S. Bureau of Reclamation (BuRec) either withdrew public or purchased private land necessary for canals and other facilities. In the early 1950s, some far-sighted individuals, including Herb Friede, a Malta-based game warden, recognized some of those lands were valuable as wildlife habitat or for the hunting opportunity they could provide. In 1953, the Montana Department of Fish and Game (as it was then called) was granted a 30-year lease on 4,567.49 acres of BuRec holdings in nine areas. Areas 7 and 8 are the primary legacies of that agreement.

The Milk River WMA was so named because of its proximity to the river. Sleeping Buffalo is near the Cree Crossing of the Milk River. The Cree Crossing is one of the best natural fords of the Milk River and was much used by the local Indian tribes. Near the ford is a group of glacially placed boulders which resemble a herd of sleeping buffalo—hence, the name.

Area 7 comprises 382 acres of mixed marshland, river oxbows, cottonwoods, shrub river bottom, and associated uplands. About 20 acres are cultivated to provide an annual crop of grain for pheasants, the primary game species.

The second most important resident game species is the white-tailed deer. The many tree stands in the cottonwood bottom are silent evidence of the importance of the whitetail hunting to local archers. Because both Areas 7

and 8 provide opportunity for upland game bird, waterfowl, and big game hunting within a very small space, big game hunters are restricted to shotgun or archery.

With their upland cover, the oxbows in Area 7 provide valuable nesting habitat for both ducks and geese. At one time, some work was done on the largest oxbow so it could be used as a rearing pond for northern pike. The northerns were hatched at an on-site fish hatchery before their release in nearby Nelson Reservoir. The fish hatchery was closed in the early 1960s, but the pond remains. Today, its crop is wild ducks and geese, muskrat and beaver, songbirds, marsh birds, cattails, and bulrush.

Wildlife is not all Area 7 supports. A local farmer receives 70 AUMs of cattle grazing in exchange for help with farming and fence maintenance (an "AUM" is an Animal Unit Month—the forage required to support a cow and her current year's calf for one month). The area also has natural gas wells and several bee hives.

Like Area 7, Area 8 provides wildlife habitat for many game and nongame animals, including white-tailed deer, ring-necked pheasants, sharp-tailed grouse, Canada geese, numerous species of ducks, swans, sandhill cranes, songbirds, shorebirds, muskrat, beaver, and a wide variety of other nongame mammals, birds, and reptiles.

Its prominent feature is a 470-acre marsh. That marsh is a living tribute to the power of positive thinking. It was created from a stand of choked cattails which provided winter and security cover for pheasants and whitetails, but little else. In 1956, the Department of Fish and Game built a dike to raise the water level so the area would subsequently flood and most of the cattails would be drowned. The result was a year-round marsh which became a natural for Canada geese. During construction, six islands were also built, and one particularly high spot became a natural island.

I came to Area 8 fresh from nearly three years at Freezout Lake WMA, so it seemed perfectly natural to conduct a goose nesting survey in late April. Armed with a short data sheet and high hopes for a good day on the marsh, Harold Wentland, wildlife manager for Region 6 (Glasgow), and I paddled away from the dike. By

MIKE ADERHOLD

Cree Crossing is one of the best natural fords on the Milk River. It was much used in earlier times by local Indian tribes.

MIKE ADERHOLD

mid-afternoon, we had found 99 goose nests, 51 of which were on the big natural island. In a follow-up survey in June, we raised our total to 119 nests, with 65 on the island. The nest density on that island—24 per acre—may be one of the highest ever recorded for Canada geese. Overall nest success was 67%, low for Canada geese nesting on islands. Geese could have abandoned some of the nests because of overcrowding.

Based on that survey, we installed 13 additional nesting platforms (three were already there) along the edge of the marsh to provide secure alternate nesting habitat. We had previously placed six large hay bales there for the same reason.

In 1984, we found 120 nests. The island had 60 nests, all six of the hay bales had nests, and all of the 16 available platforms had goose nests. Thirteen were found on muskrat houses. For the nests of which we knew the fate, success was 100% on the artificial structures, compared with 64% for others.

In 1983 and 1984, Area 8 produced about 650 goslings—in an area that produced none before development.

Area 8 receives about 3,000 recreational visits per year. Although hunting (pheasants, white-tailed deer, and waterfowl) is the predominant recreational use, the area also offers bird watching, photography, and some fine landscapes and wildlife-viewing opportunities for artists.

Although Areas 7 and 8 provide diverse hunting, they remain relatively unknown. Perhaps the main reason is their small size. It doesn't take much hunting pressure to move ducks and geese the short distance to Nelson Reservoir, which is mostly closed to waterfowl hunting. The resident upland species become equally wary.

Despite this shortcoming, there will always be a small group of hunters who live close enough, who have the time, who'll take that chance, who'll enjoy the experience. For them, the numbers 7 and 8 will always carry special significance. ■